2025

AP® Biology

Sample Student Responses and Scoring Commentary

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Free-Response Question 4

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Question 4: Conceptual Analysis — 4 points

Twenty million years ago the Caribbean Sea and Pacific Ocean were connected, and water flowed freely between the two bodies of water. Many of the same marine species were found in both areas. Over millions of years, the land referred to as the Isthmus of Panama formed, eventually closing off the connection between the Caribbean Sea and Pacific Ocean and creating two separate bodies of water. The ecology of these two marine habitats was dramatically altered by this land formation. The warmer Caribbean water could no longer flow west, so the Pacific water cooled and became more nutrient-rich, while the Caribbean water became warmer.

A	**Describe** the genetic evidence that evolution is occurring in a population. Examples of acceptable responses may include the following: • There are changes in allele/gene frequencies. • There are heritable changes in phenotypes.	**1 point**
B	**Explain** how the isolation of marine species by the formation of a land barrier can lead to divergent evolution of those species. Examples of acceptable responses may include the following: • Selective pressures could result in different allele/gene frequencies. • (The land barrier) results in reproductive isolation/lack of gene flow/allopatric speciation. • Different environmental conditions/pressures select for different alleles/genotypes/phenotypes.	**1 point**
C	The formation of the Isthmus of Panama connected two continents, North America and South America. Many North American land animal species migrated to South America after the formation of the isthmus and occupied similar niches as South American species. **Predict** the effect the formation of the isthmus had on resource availability for South American species. • (Resource availability) would have decreased.	**1 point**
D	**Justify** your prediction in part C. • More species would now be competing for the same resources, (resulting in fewer resources for each individual).	**1 point**

Question 4

Write your response to **QUESTION 4** on this page. Do not skip lines.

A) The allele & genotype frequencies changing by generation shows that evolution is occurring.

B) Isolation inhibits gene flow, meaning that changes in allele & genotype frequencies are not shared, resulting in divergent evolution.

C) Resource availability decreased

D) Species migrated South, which increased competition between species. There were more things to feed with the same amount of resources, so resources became less available.

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Question 4

Write your response to **QUESTION 4** on this page. Do not skip lines.

A. Evolution is occurring when new environmental pressures arise and the organisms must adapt.

B. The land barrier creates a reproductive barrier between species. Additionally, the newly isolated environments' temperatures changed and this puts new selective pressure on the isolated species, causing them to evolve divergently.

C. Resource availability decreased for South American species.

D. This is because many North American animals migrated to South America, which causes a population increase in South America. This increases competition and decreases resource availability.

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Question 4

Write your response to **QUESTION 4** on this page. Do not skip lines.

A) when dna changes in a population evolution is occuring over a long time period.

B) The isolation causes the species to have new resources, predators & habitats. and allows them to only breed among themselves. this means that new mutations will change the species in different ways causing divergent evolution.

c) Resource availibility went down

D) since northern animals migrated South & many occupied similar niches there is more population competing for same resources causing availibility to go down.

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Use a pencil or pen with black or dark blue ink. Do NOT write your name. Do NOT write outside the box.

Question 4

Note: Student samples are quoted verbatim and may contain spelling and grammatical errors.

Overview

NEW for 2025: The question overviews can be found in the *Chief Reader Report on Student Responses* on AP Central.

Sample: 4A
Score: 4

The response earned 1 point in part A for describing the "allele & genotype frequencies changing by generation" as genetic evidence of evolution. The response earned 1 point in part B for explaining that "[i]solation inhibits gene flow" between species. The response earned 1 point in part C for predicting that "[r]esource availability decreased." The response earned 1 point in part D for justifying their prediction by stating that "[s]pecies migrated South, which increased competition between species."

Sample: 4B
Score: 3

The response did not earn a point in part A because it does not describe genetic evidence for evolution. The response earned 1 point in part B for explaining how the "land barrier creates a reproductive barrier between species." The response earned 1 point in part C for predicting that "[r]esource availability decreased for South American species." The response earned 1 point in part D for justifying their prediction by stating that the migration of animals "increases competition."

Sample: 4C
Score: 2

The response did not earn a point in part A because it does not describe that the allele frequencies change in the population when evolution is occurring. The response did not earn a point in part B because it does not explain that reproductive isolation occurs among individuals of a population when geographic isolation takes place. The response earned 1 point in part C for predicting that "[r]esource availibility went down." The response earned 1 point in part D for justifying their prediction by stating that "there is more population competing for same resources causing availibility to go down."