

4. 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.
B. **Explain** how the isolation of marine species by the formation of a land barrier can lead to divergent evolution of those species.

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.

- C. **Predict** the effect the formation of the isthmus had on resource availability for South American species.
D. **Justify** your prediction in part C.

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.

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- A** **Describe** the genetic evidence that evolution is occurring in a population. **1 point**
- Examples of acceptable responses may include the following:
- There are changes in allele/gene frequencies.
 - There are heritable changes in phenotypes.
- B** **Explain** how the isolation of marine species by the formation of a land barrier can lead to divergent evolution of those species. **1 point**
- 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.
- 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. **1 point**
- (Resource availability) would have decreased.
- D** **Justify** your prediction in part C. **1 point**
- More species would now be competing for the same resources, (resulting in fewer resources for each individual).
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