AP Biology Practice Test 3 Life Continues to Evolve

Question 1
Three million years ago, populations of snapping shrimp were separated on either side of Central America when the Isthmus of Panama closed, creating a land bridge between North and South America. Researchers found that snapping shrimp on one side of the isthmus appeared nearly identical to those on the other side. It is believed that the separate populations were once members of the same population. When researchers put males and females from different sides of the isthmus together, they snapped at each other aggressively instead of mating.

Which of the following best describes what happened to the snapping shrimp as evidenced by the aggression observed?

A. Sympatric speciation brought about by polyploidy
B. Hybridization caused by geographic isolation
C. Allopatric speciation caused by geographic isolation
D. Coevolution brought about by habitat isolation

Question 2
Bowerbirds of Australia and New Guinea have one of the most unique courtship rituals in the animal kingdom. A great bowerbird (*Chlamydera nuchalis*) makes a bower with colorful and unique objects, such as glass, and pieces of litter. The male golden-fronted bowerbird (*Amblyornis flavifrons*) will decorate his bower with colorful fruit. The Vogelkop bowerbird (*Amblyornis inornata*) makes a cone-shaped bower that can reach a meter high. He decorates the entrance to his bower with bright flowers.

Evolutionary changes in mating rituals, like the differences in bower construction by the bowerbirds, can contribute to which of the following:

A. Intrasexual selection
B. Speciation
C. Genetic drift
Question 3
Three-spine sticklebacks were introduced to a lake in Switzerland over 150 years ago. Since that time, the fish have begun splitting into two separate types. One group lives in the main lake, and the other group lives in the streams that flow into it. The main lake dwellers are larger, with longer spines and tougher armor. Both types of fish breed in the same streams at the same time of the year, yet they are splitting into two genetically and physically different types.

How would evolutionary biologists classify this type of speciation?

A. Sympatric
B. Allopatric
C. Reproductive isolation
D. Hybridization

Question 4
Western spotted skunks (*Spilogale gracilis*) breed in the fall, whereas and eastern spotted skunks (*Spilogale putorius*) breed in late winter. What type of reproductive barrier prevents these species from being classified as the same species?

A. Habitat isolation
B. Mechanical isolation
C. Gametic isolation
D. Temporal isolation

Question 5
Which of the follow scenarios describes *allopatric* speciation?

A. A small segment of the original population is exposed to different environmental conditions, and a new subspecies emerges through natural selection. Over time, a new species is formed without geographic isolation.

B. A population of species enters a new niche or habitat at the edge of the parent species’ range. There is no physical barrier between the populations, but the occupancy of a new niche becomes a barrier to gene flow between the parent population and the new population.
Rapid and abrupt species formation from genetic drift or chance

Part of the population becomes geographically isolated from the main population, separating the population into two isolated groups. The populations become two distinct species.

**Question 6**

When hybrids are less fit than members of their parent species, natural selection may strengthen prezygotic barriers, and therefore reduce the formation of unfit hybrids. Which of the following is an example of strengthening reproductive barriers during hybridization?

- A. Two hundred of the former 600 species of cichlids in Lake Victoria have vanished over the past 30 years. Water pollution caused the water to become murky, reducing the ability of the females to use color to distinguish males of their own species. This resulted in an increased frequency of mating between members of species that had formerly been isolated reproductively. Consequently, many hybrids have been produced, and many of the former parent species have been lost.
- B. Two species of toads in genus *Bombina* have produced hybrid toads with increased rates of embryonic mortality and abnormality, such as ribs fused to the spine and malformed mouthparts in the tadpoles. The hybrids have poor survival and reproduction and produce few viable offspring with members of the parent species.
- C. In the Appalachian Mountains, two species of ground crickets have formed hybrids where the two species are closely interspersed. The fitness of the hybrid varies from year to year and sometimes exceeds the fitness of both parent species.
- D. *Heliconius* butterflies in the Amazon breed with other species within the same genus, resulting in a hybrid with more distinctive colors. The distinctive colors warn birds that these butterflies contain cyanide, thus strengthening the survival abilities of the butterflies.

**Question 7**

In the early 1900s, three species of wildflowers were introduced to the United States from Europe. When the species crossed with each other they often produced sterile hybrids. However, after about 50 years, two new varieties were growing, both able to reproduce their own kind but not able to reproduce with any of the original three species. After researching how this came to be, it was discovered that a mutation occurred that resulted in the parental plants producing gametes with two or more sets of chromosomes. When these gametes fused with other gametes the result was offspring with additional sets of chromosomes.

This type of speciation occurred due to:
Question 8
The “oxygen revolution” had an enormous impact on life, and likely
A. Provided the proper environment for packaging molecules into “protobionts”
B. Caused RNA molecules with certain base sequences to become more stable and replicate faster
C. Caused the extinction of many prokaryotic groups due to the rising concentration of O₂
D. Resulted from the sudden appearance of animals in the Cambrian period

Question 9
It is hypothesized that eukaryotic features evolved from prokaryotic cells when smaller prokaryotic cells, the precursors of mitochondria and plastids, began living within larger cells. This model is referred to as:
A. Endosymbiosis
B. Adaptive radiation
C. Simple metabolism
D. The Cambrian explosion

Question 10
Which of the following was not a large-scale process which influenced major evolutionary changes in life on Earth?
A. Adaptive radiation
B. The founder effect
C. Continental drift
D. Mass extinctions

Answers and Explanations
Question 1 Explanation:
The correct answer is (C). Allopatric speciation occurs when one species is divided into two. The original population is physically separated into two subpopulations and the two groups live in different locations. Over time, the gene pools of the isolated populations continue on their own evolutionary paths. Eventually, the populations are no longer able to interbreed if they ever come together again. This is one of the main processes by which new species arise.

Question 2 Explanation:
The correct answer is (B). If two species evolve different mating rituals, it may permanently isolate them from one another and complete the process of speciation.

Question 3 Explanation:
The correct answer is (A). Sympatric speciation occurs in populations that live in the same geographic regions.

Question 4 Explanation:
The correct answer is (D). Species that breed during different seasons, times of the day, or different years cannot mix their gametes.

Question 5 Explanation:
The correct answer is (D). Allopatric speciation occurs when gene flow is interrupted because the population has been divided into geographically isolated subpopulations.

Question 6 Explanation:
The correct answer is (B). Since the hybrids of the toads do not survive to pass on their genes, the reproductive barriers are strengthened, or reinforced.

Question 7 Explanation:
The correct answer is (A). Polyploidy is a condition in which a cell is formed that has an extra set(s) of chromosomes.

Question 8 Explanation:
The correct answer is (C). In certain chemical forms, oxygen attacks chemical bonds and can inhibit enzymes and damage cells. This rising concentration of \( \text{O}_2 \) probably killed many groups of prokaryotes, except for species surviving in habitats that remained anaerobic.

Question 9 Explanation:
The correct answer is (A). An endosymbiont is a cell that lives within larger cells. It is believed that prokaryotic ancestors of mitochondria and plastids probably entered the host cell as undigested prey or internal parasites.

**Question 10 Explanation:**
The correct answer is (B). The founder effect is genetic drift that occurs when a few individuals from a larger population become isolated and form a new population with a less genetically diverse gene pool than the original population. Adaptive radiation, continental drift and mass extinctions are all major large-scale process that influenced major changes to life on earth.
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