

## Answer Guide

### Evolution: Life Through Time

## Grades 9–12

1. Speciation is the **formation of new and distinct species in the course of evolution. Their different beak shapes.** Finches ate different things. Some birds became so specialized they didn't mate with birds that ate other foods. Over many generations, these groups evolved different beak shapes. They are now recognized as different species.
2. **The relationship between the coral and microscopic organisms called zooxanthellae.** *Zooxanthellae* use photosynthesis like plants to produce sugars using water, carbon dioxide, and sunlight. **Corals get energy from these sugars.** In exchange, **they provide zooxanthellae with nutrients and access to sunlight.**
3. Earth was warmer and wetter than it is now, and dense forests covered much of the globe. **Coal formed when dead plants were compressed and heated deep underground for millions of years.**  
  
When the plants were alive, they took carbon dioxide from the air and used the carbon to form new cells as they grew. When they were buried underground, the carbon in their tissues remained out of circulation. **Burning coal releases carbon dioxide, reintroducing that stashed carbon back into the atmosphere. Scientists have linked increased levels of carbon dioxide to increased global temperatures and climate change.**
4. The distinguishing skeletal feature of synapsids is a **single opening at the back of the skull**—other groups have two or none. Jaw muscles pass through this opening to attach to the top of the skull. **Mammals.**
5. Madagascar is a sliver of the Indian subcontinent that separated as Gondwana split apart. *Majungasaurus* didn't have to swim to Madagascar—they **evolved from animals that lived there when it separated from India** about 90 million years ago.

- Slow growth and cannibalism** support the hypothesis that the environment on Madagascar had limited food and water when *Majungasaurus* lived there 68 million years ago.
6. *Archaeopteryx* is a **fully-feathered flying dinosaur that illustrates a transitional step in the evolution of dinosaurs into birds** found in a lagerstätte in Solnhofen, Germany. **Solnhofen rocks formed in a shallow lagoon where many of the fossils have soft tissues preserved in amazing detail.** This exceptional preservation enables scientists to study a fairly complete ecosystem from 150 million years ago.
  7. **The malleus, incus, and stapes.** These bones form part of the inner ear in mammals. **Reptiles, birds, and the ancestors of mammals have only the stapes.** Mammal embryos start with just one ear bone, but as they grow, two small bones detach from the jaw and become part of the ear. In our distant ancestors, these bones developed into parts of the jaw instead of the ear—just like they do in modern reptiles and birds.
  8. The most significant change between *Australopithecus africanus* and *Homo sapiens* is **increased brain size.**  
  
*Australopithecus Sediba* had a **different way of walking**, landing on the outside edge of its feet. This suggests that *A. sediba* was heading down a different trajectory.
  9. This event gives us **detailed information about extinction processes. If we know what caused mastodons to go extinct, we might be able to predict the impacts of poaching and land modification on modern wildlife.**
  10. **Answers will vary.**