

## ANSWERS TO EXERCISES

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|---|-------------------------------|----------|
| 1. Fossils                                    | 9. false, incapable of change | 21. d    |
| 2. catastrophism                              | 10. true                      | 22. a    |
| 3. uniformitarianism                          | 11. false, fossils            | 23. g    |
| 4. inheritance of<br>acquired characteristics | 12. true                      | 24. f    |
| 5. convergent                                 | 13. false, common ancestry    | 25. c, i |
| analogous                                     | 14. true                      | 26. c    |
| homologous                                    | 15. true                      | 27. b    |
| 6. vestigial                                  | 16. false, unrelated          | 28. d    |
| 7. analogous                                  | 17. false, artificial         | 29. b    |
| homologous                                    | 18. true                      | 30. e    |
| 8. Artificial                                 | 19. h                         | 31. d    |
|   | 20. b                         | 32. c    |
33. Lamarck would explain the long proboscis by the "inheritance of acquired characteristics." The ancestral species was uniform for a short proboscis, but the moths began to habitually stretch their probosci deep into the long trumpet flowers to get nectar, stretching their probosci in the process. These slightly stretched probosci were in turn passed down to the next generation who repeated the process of stretching their probosci into the flowers and passing the longer probosci on. After many generations of this, all the moths of this species were born with very long probosci. Darwin would explain the long probosci by natural selection. Individuals in the ancestral species displayed genetic variation in proboscis length and those with longer probosci could get more nectar from the flowers, allowing them to live longer and out-reproduce those with shorter probosci. This produced the next generation with a higher percentage of moths with longer probosci. After many generations of natural selection favoring moths with longer probosci, the entire species showed this trait.
34. Catastrophism is the idea that the Earth underwent a series of periodic worldwide catastrophes resulting in significant physical changes as well as the extinction of life. After each of these catastrophes, new life forms more similar to modern forms could have been created. Thus, evolution did not occur. Uniformitarianism is the idea that physical changes that have occurred during the history of the Earth occur gradually and over long periods of time, just like they do today. Life forms would also change gradually in response to changes in their environments (in other words, evolve), resulting in the formation of fossils, the more recent of which more closely resemble modern forms.

35. It is possible that the group of feathered dinosaurs existed much earlier than 120 million years ago, and might have existed before the appearance of the first true birds 150 million years ago. If that is true, then the birds could have evolved from the ancient feathered dinosaurs. Evidence to support this hypothesis would be finding fossils of feathered dinosaurs more than 150 million years old.
36. Lamarck would say that because of the environmental change (the tree trunks became darker due to pollution), moths during their lifetimes gradually began to produce more dark pigment in their wings due to a desire to become less conspicuous. Each generation, these slightly darker wings were passed on to their offspring, who made them darker still. By the time 50 generations passed, all the moths had very dark wings. Darwin would say that initially, there was some genetic variation among the moths and while most of them had light wings, a few had dark wings. Before pollution occurred, the darker moths were conspicuous and were eaten quickly by birds, but the lighter moths lived longer and produced more offspring. As the tree trunks became darker due to pollution, however, the darker moths became less conspicuous than the lighter ones, so that birds ate the lighter moths quickly, more often not seeing the darker ones. This allowed the darker moths to begin out-reproducing the lighter moths, and the frequency of darker moths increased while the frequency of the lighter moths decreased. Eventually, the population would consist of many dark moths and few light moths due to the natural selection by birds of preferentially finding and eating the more conspicuous color of moth in the changing environment.
37. According to the American Museum of Natural History, *Archaeopteryx* is a very primitive bird, about the size of a pigeon, that lived around 150 million years ago, in what is today southern Germany. It had teeth like dinosaurs. It had claws in its hands, like dinosaurs (modern birds do not have claws in their wings). *Archaeopteryx* had a relatively small sternum, or breastbone, and also, behind this, it had abdominal ribs. This structure is similar to the one present in dinosaurs, but very different from the one present in modern birds, which do not have abdominal ribs, and have a very large sternum. *Archaeopteryx* had a long tail that was similar to the long tails of its dinosaurian relatives, in contrast to the short tails of modern birds. It is considered a bird since it possessed feathers arranged in a pattern similar to that of modern birds.
38. According to the Carnegie Museum of Natural History, scientists were amazed by *Confuciusornis*' similarity to *Archaeopteryx*, the oldest known true bird, which was unearthed in 1861. Both animals have long feathers and huge curved claws. However, where *Archaeopteryx* had a mouth filled with teeth, *Confuciusornis*—like modern birds—had a toothless beak.
39. *US News and World Report* (2/14/00) noted: "Did dinos soar? Imaginations certainly took flight over *Archaeoraptor liaoningensis*, a birdlike fossil with a meat-eater's tail that was spirited out of northeastern China, "discovered" at a Tucson, Ariz., gem-and-mineral show last year [1999], and displayed at the National Geographic Society in Washington, D.C. Some 110,000 visitors saw the exhibit, which closed January 17, 2000; millions more read about the find in November's *National Geographic*. Now, paleontologists are eating crow. Instead of "a true missing link" connecting dinosaurs to birds, the specimen appears to be a composite, its unusual appendage likely tacked on by a Chinese farmer, not evolution." "*Archaeoraptor* is not the first "missing link" to snap under scrutiny. In 1912, fossil remains of an ancient hominid were found in England's Piltdown quarries and quickly dubbed man's apelike ancestor. It took decades to reveal the hoax. But just as Piltdown man didn't derail scientists' views on human evolution, one "Piltdown chicken" doesn't overturn the "compelling" evidence that birds evolved from dinosaurs."