Answer Key

The Environment and Change Over Time

Lesson 1

Before You Read
1. Agree
2. Disagree

Read to Learn
1. Many parts of the fossil record are missing.
2. Soft tissues are usually eaten by animals or broken down by bacteria.
3. from mineralization, carbonization, molds and casts, trace fossils, and original material
4. Relative-age dating helps determine the relative order in which species have lived on Earth.
5. between 546 and 520 mya, probably about 530 mya
6. Most minerals that contain radioactive isotopes are in igneous rocks, not sedimentary rocks. The radioactive minerals that are in sedimentary rocks come from the weathering of igneous rocks.
7. a chart that divides Earth’s history into different time units
8. fossils
9. single cells, insects, dinosaurs, humans
10. $4.9 \times 10^8$ years
11. Students should circle the Late Cretaceous; about 60 million years ago
12. Changes in the environment can cause extinctions if species cannot survive in the new conditions.
13. Many fossil species in nearby rock layers had similar body plans and similar body parts, showing that they might have been related to each other.
14. Fossils show how species change over time.
15. The horse’s body got bigger and its toes became a hoof.

After You Read
1. Students write a sentence explaining the difference between a cast and a mold. For example, a mold is an impression of an organism in mud or sand; a cast forms when mud or sand fills in the mold and hardens.
2. Types of Fossils

- mineralized fossils
- carbonized fossils
- casts and molds
- trace fossils
- original material

3. Students explain that different fossils from the fossil record mark the different time periods of the geologic time scale. Theses fossils stand for the beginning or end of certain events or periods of change.

Lesson 2

Before You Read
3. Disagree
4. Agree

Read to Learn
1. Charles Darwin was an English naturalist who, in the mid-1800s, developed the theory of evolution by natural selection.
2. He saw that giant tortoises on each island looked different.
3. If a variation helps an organism survive in its environment, it increases in the population through natural selection.
4. All of the tortoises in image 1 should be labeled S. The tortoise in the front of image 2 should be labeled L; the other three should be labeled S. All of the tortoises in images 3 and 4 should be labeled L. Over time, tortoises developed longer necks.
5. Beneficial variations spread to entire populations through natural selection and produce adaptations that enable the populations to survive in their environments.
6. b
7. In camouflage, species adapt to their surroundings. In mimicry, species adapt to resemble other species.
8. Sample answer: Their fur coats might become thinner.
9. Both result in certain characteristics being selected so that individuals with those characteristics will produce more offspring.
After You Read
1. Students write a description of a living thing that uses camouflage or mimicry to survive. For example, a toad that has skin with the texture and color of lichen on a rock is an example of camouflage. A nonpoisonous frog that has bright markings that look like those of a poisonous frog is an example of mimicry.
2. left to right: d, b, a, c
3. Students explain that in both evolution and selective breeding, certain characteristics are selected. The individuals with the selected characteristics go on to produce offspring. Over time, the species changes. In evolution, natural selection causes change. In selective breeding, artificial selection causes the change.

Lesson 3

Before You Read
5. Disagree
6. Agree

Read to Learn
1. They provide support for the skin and tissues that make up the wings.
2. The more similar a structure is in two living species, the more likely it is that the species share a close common ancestor.
3. The pelvis is the structure that supports legs. The vestigial pelvis shows that the ancestors of the whale once had legs.
4. A structure with no or reduced function in a living species is evidence that the species evolved from an ancestor that used the structure.
5. They show that embryos of different species resemble each other at certain stages of development. They provide evidence that organisms of different species share a common ancestor.
6. the study of gene structure and function
7. Molecular biologists compare sequences of shared genes or proteins in different species to determine how closely they match. The closer the match is, the more likely it is that the species are related to each other.
8. The theory of evolution by natural selection is the cornerstone of modern biology.
9. Scientists debate the rate at which natural selection produces new species.
10. c

**After You Read**

1. Possible answer: The human tail bone is likely a vestigial structure that might have come from a tail that an ancestor used for balance.

2.

<table>
<thead>
<tr>
<th>Structures</th>
<th>Example Pair of Structures</th>
<th>Similar Structure or Function (circle one)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analogous</td>
<td><em>Sample: fly’s wing and bat’s wing</em></td>
<td>similar function</td>
</tr>
<tr>
<td>Homologous</td>
<td><em>Sample: human’s hand and bat’s wing</em></td>
<td>similar structure</td>
</tr>
<tr>
<td>Vestigial</td>
<td>pelvic bone in modern whales pelvic bone in whale ancestors</td>
<td>similar structure</td>
</tr>
</tbody>
</table>

3. Students explain that highlighting the main ideas and supporting details can help them focus on the most important parts of the lesson.