# Answer Key

## Directed Reading

### SECTION: HOW DID LIFE BEGIN?

1. the sun, volcanic eruptions, and lightning
2. oxygen
3. No. While the experiment showed that complex biological molecules can form from simple building blocks, conditions on Earth would not have allowed the ammonia and methane used in the experiment to exist in the atmosphere. So, organic molecules could not have formed in the way that they did in the Miller-Urey experiment.
4. One hypothesis is that the molecules formed in chemical reactions near hydrothermal vents in the oceans. Another hypothesis is that organic molecules came to Earth from space on meterorites or comets.
5. a
6. d
7. d
8. a
9. b
10. c

### SECTION: THE AGE OF EARTH

1. sedimentary
2. fossil record
3. 3
4. 1
5. 4
6. 2
7. Fossils are most likely to form in watery environments—such as wet lowlands, slow-moving streams, lakes, and shallow seas—or in areas near volcanoes that spew volcanic ash.
8. A fossil can be determined to be older, younger, or about the same age as another through relative dating. This process depends on the principle of superposition, which states that younger strata of rocks overlay older strata of rocks.
9. An index fossil is a fossil of an organism that was common and widespread over Earth during a certain time in Earth's history.
10. radiometric dating
11. carbon-14
12. absolute
13. half-life
14. Paleozoic, Mesozoic, Cenozoic
15. A mass extinction is an event in geologic time during which large numbers of species become extinct. A mass extinction marked the beginning of each geologic era.

### SECTION: EVOLUTION OF LIFE

1. Precambrian
2. prokaryotes
3. archaea
4. prokaryotes
5. stromatolites
6. 3
7. 1
8. 2
9. 5
10. 4
11. The theory of endosymbiosis proposes that mitochondria and chloroplasts are the descendants of symbiotic aerobic eubacteria engulfed by larger bacteria.
12. because most animals need plants for food
13. b
14. d
15. 2
16. 3
17. 6
18. 4
19. 1
20. 5

## Active Reading

### SECTION: HOW DID LIFE BEGIN?

1. ammonia, methane, and others
2. ultraviolet radiation and lightning
3. complex organic molecules
4. c

### SECTION: THE AGE OF EARTH

1. William Smith
2. principle of uniformitarianism
3. a particular series of fossil life-forms
4. recent animals
5. middle animals
6. Paleozoic
7. c
8. d

### SECTION: EVOLUTION OF LIFE

1. Both are types of prokaryotes.
2. *Sulfolobus* is a living group of archaeans.
3. The cell walls of bacteria contain peptidoglycan, and their cell membranes contain the same type of lipids found in eukaryotes.
4. The cell walls of archaeans lack peptidoglycan, and their cell membranes contain unique lipids.
5. The first single-celled organisms to exist on Earth were closely related to archaeans.
6. Chemical evidence suggests that the first eukaryotic cells likely evolved from archaeans.
7. a

## Vocabulary Review (Basic)

1. endosymbiosis
2. half-life
3. Microspheres
4. relative
5. c
6. b
7. a
8. d
9. cyanobacteria
10. ribozyme
11. isotopes
12. eras

## Vocabulary Review (General)

1. Relative dating is the process of assigning a relative age (older, younger, the same) to fossils and layers of rocks based on their location in reference to each other. Radiometric dating is the process of determining an absolute age in years based on the ratio of radioisotopes and their daughter products.
2. The fossil record is the history of life in the geologic past as indicated by the fossil remains of living things. The geologic time scale is a way of dividing Earth's geologic past into parts based on the fossil record and mass extinctions.
3. d
4. e
5. a
6. f
7. b
8. c

## Science Skills

### INTERPRETING GRAPHICS

1. d
2. c
3. a
4. b
5. Conditions on Earth have changed several times since Earth was formed. With each change, some organisms were better able to survive the new conditions than other organisms were. Some changes were brought about by geological and climate changes. These changes caused mass extinctions. The surviving organisms had less competition for resources.
6. The 50 million years following the emergence of reptiles was a period of widespread drought. Reptiles, which are better adapted for dry conditions, had an apparent advantage over amphibians. Gradually, reptiles became the dominant animal group on Earth.
7. Cyanobacteria added oxygen to Earth's atmosphere, which made possible the development of a protective layer of ozone.

## Concept Mapping

1. prokaryotes
2. fossils
3. 2.5 billion years ago
4. cyanobacteria
5. ozone
6. life on land
7. bacteria
8. mitochondria or chloroplasts
9. chloroplasts or mitochondria
10. endosymbiosis

# Critical Thinking

1. g
2. f
3. e
4. c
5. b
6. d
7. a
8. c
9. d
10. b
11. a
12. e
13. e, g
14. d, b
15. c, f
16. a, h
17. c
18. a
19. b
20. d