Name: _____ **Class:** _____ **Date:** _____ **ID: A**

Ch. 17 review

Short Answer

1. If the half-life of Uranium-238 is 4.45×10^9 years, how old is a fossil containing 1/8 of the original sample?

Other

USING SCIENCE SKILLS

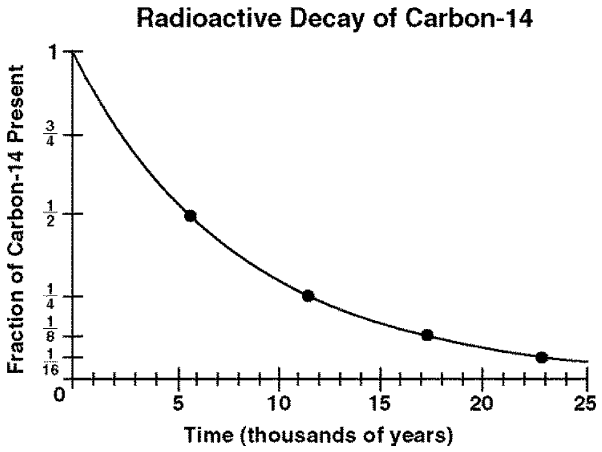

Figure 17–2

2. **Using Tables and Graphs** According to Figure 17–2, how many half-lives have passed if a fossil has one eighth of its original amount of carbon-14?

3. **Inferring** According to Figure 17–2, in which case would carbon-14 be more useful for radioactive dating: for wooden beams in native American cave dwellings, which are probably less than 7000 years old, or for the fossil of an early mammal that is probably 100,000 years old? Explain your answer.

USING SCIENCE SKILLS

Figure 17–3 shows a version of Stanley Miller and Harold Urey's apparatus used to simulate what was thought to be conditions on early Earth.

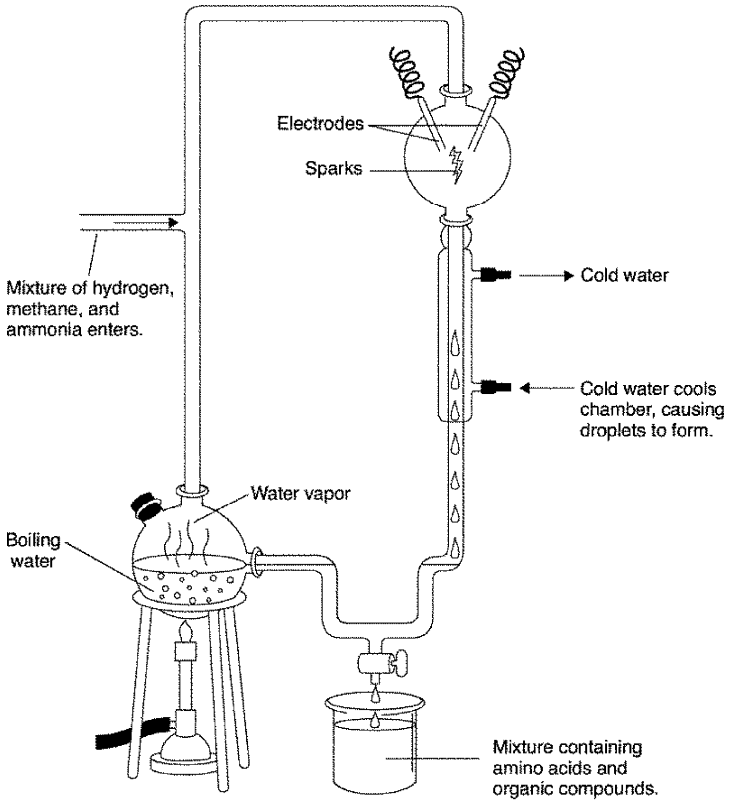

Figure 17–3

4. **Inferring** In the apparatus in Figure 17–3, what do the electrodes produce and what does that simulate?
5. **Inferring** In this experiment, the researchers made sure that no microscopic life forms were present in the system shown in Figure 17–3. Explain why that was necessary.
6. **Drawing Conclusions** In the experiment in Figure 17–3, what conclusions can be drawn from the mixture that was collected in the container on the bottom?

Essay

7. Explain the principle behind radioactive dating.
8. What is the geologic time scale and how does it relate to the fossil record?
9. Describe Stanley Miller and Harold Urey's famous experiment. Describe their results as well as the results of similar experiments based on more current knowledge.
10. Define and explain the endosymbiotic theory.
11. Describe the milestones in the evolution of life that occurred during Precambrian Time.

12. What important event at the end of the Mesozoic opened up new habitats for mammals? How did mammals—including humans—change through the Cenozoic?

Ch. 17 review
Answer Section

SHORT ANSWER

1. ANS:
   $3 \times 4.45 \times 10^9 = 1.34 \times 10^{10}$

   PTS: 1

OTHER

2. ANS:
   Three half-lives have passed.

   PTS: 1 DIF: A REF: p. 420 OBJ: 17.1.2
   STA: IPC and Bio TEKS 2C.1
3. ANS:
   Carbon-14 dating would be more useful for the younger fossils. The remaining fraction of carbon-14 in a 100,000-year-old sample would be very small and probably difficult to measure precisely.

   PTS: 1 DIF: A REF: p. 420 OBJ: 17.1.2
   STA: IPC and Bio TEKS 2C.1 NOT: IPC and Bio TEKS 2C.2
4. ANS:
   The electrodes produce a spark, which simulates lightning.

   PTS: 1 DIF: E REF: p. 424 OBJ: 17.2.2
5. ANS:
   The researchers had to be sure that the original simple substances—not any tiny organisms that might be present—were the only possible source of the organic molecules they hoped to find.

   PTS: 1 DIF: E REF: p. 424 OBJ: 17.2.2
6. ANS:
   The mixture of amino acids and other organic compounds demonstrates that the kinds of molecules that are necessary for life could have arisen from simple compounds thought to have been present on early Earth.

   PTS: 1 DIF: E REF: p. 424 OBJ: 17.2.2

ESSAY

7. ANS:
   Radioactive dating involves using a radioactive isotope in a sample to determine its age. A radioactive element decays at a steady rate called its half-life. Researchers compare the ratio of two isotopes, such as radioactive carbon-14 and nonradioactive carbon-12, to find the fraction of radioactive atoms that have decayed. That information, along with the isotope's half-life, reveals the sample's age.

   PTS: 1 DIF: A REF: p. 420 OBJ: 17.1.2

8. ANS:
The geologic time scale is like a calendar of evolutionary history that is based on a study of Earth's rocks and the fossils they contain. Because rock layers appear in the same order in which they were formed, each layer represents a different period of time. Lower layers are older than upper layers if they have not been disturbed. Therefore, fossils found in lower layers are older than fossils found in upper layers. The order in which types of fossils appear shows the way life changed over time.

PTS: 1 DIF: E REF: p. 421 OBJ: 17.1.3

9. ANS:
Miller and Urey filled a flask with hydrogen, methane, ammonia, and water vapor, and then passed electric sparks through the resulting mixture to simulate lightning. Over a few days, several amino acids accumulated. Later experiments based on more current knowledge of Earth's early atmosphere have also produced organic compounds, including cytosine and uracil, two RNA bases.

PTS: 1 DIF: A REF: p. 424 OBJ: 17.2.2
STA: Bio TEKS 3F.2

10. ANS:
The endosymbiotic theory proposes that eukaryotic cells arose from living communities formed by several organisms. This began when some prokaryotic cells began evolving internal cell membranes, forming the ancestors of eukaryotes. Later, other prokaryotic organisms entered the ancestral eukaryotes and began living inside them, resulting in a symbiotic relationship between these early eukaryotes and the prokaryotes they carried. Early prokaryotes that could use oxygen to generate ATP were the forerunners of modern mitochondria. Photosynthetic prokaryotes evolved into the chloroplasts of modern plants and algae.

PTS: 1 DIF: A REF: p. 427 OBJ: 17.2.4

11. ANS:
Life arose and the first living things were simple anaerobic organisms. Later, photosynthetic organism evolved and added oxygen to Earth's atmosphere. Still later, aerobic life forms evolved and the first eukaryotes appeared. Some eukaryotic forms evolved into multicellular organisms that became increasingly complex. All life at this time was confined to the sea.

PTS: 1 DIF: A REF: p. 429 OBJ: 17.3.1
STA: Bio TEKS 7B.3

12. ANS:
At the end of the Mesozoic, the dinosaurs became extinct. During the Cenozoic, mammals moved into new habitats, diversified, and evolved adaptations that allowed them to live in many different environments in the sea, in the air, and on land. Newly evolved grasses supported grazing mammals. Some mammals became very large. The earliest human ancestors appeared about 4.5 million years ago, followed by modern humans about 100,000 years ago.

PTS: 1 DIF: E REF: p. 432 | p. 433 | p. 434
OBJ: 17.3.1 STA: Bio TEKS 7B.3 NOT: Bio TEKS 7B.4, Bio TEKS 7B.6