## Bio.10- Q2W1-Qs Bank- History of life

**True/False**
*Indicate whether the statement is true or false.*

____ 1. Earth is thought to have formed about 4.6 billion years ago.
____ 2. The conditions on primitive Earth were very suitable for life.
____ 3. Geological events on Earth set up conditions that would play a major role in the evolution of life on Earth.
____ 4. By the end of the Mesozoic, the continents took on their modern shape.
____ 5. The first organisms appeared on land between 3.9 and 3.4 billion years ago.

**Matching**

*Match each item with the correct statement below.*

a. petrified fossil
b. imprint
c. trace fossil
d. cast
e. amber-preserved
f. fossil
g. mold

____ 6. A footprint, trail, or burrow, providing evidence of animal activity
____ 7. A fossil embedded in tree sap, valuable because the organism is preserved intact
____ 8. An exact stone copy of an original organism, the hard parts of which have been penetrated and replaced by minerals
____ 9. Any evidence of an organism that lived long ago
____ 10. The fossil of a thin object, such as a leaf or feather, that falls into sediments and leaves an outline when the sediments hardened
____ 11. An empty space left in rock, showing the exact shape of the organism that was buried and decayed there
____ 12. An object formed when a mold is filled in by minerals from the surrounding rock

**Essay**

13. Explain how relative dating works.
14. What is the limitation of relative dating?
15. What dating technique is often used by paleontologists to determine the specific age of a fossil?
16. How do scientists use this dating technique to determine the ages of rocks or fossils?
17. Describe the likely characteristics of the first organisms on Earth.
18. What is an autotroph? What factors helped them thrive on Earth?
19. What present-day organisms may be similar to the first autotrophs? Why?
20. What change occurred in Earth's atmosphere after the evolution of photosynthesizing prokaryotes? Why?

**Multiple Choice**
*Identify the choice that best completes the statement or answers the question.*

____ 21. The primitive Earth atmosphere is hypothesized to have consisted mostly of _____.
a. oxygen, nitrogen, and water vapor
b. hydrogen, methane, ammonia, and water vapor
c. amino acids, ATP, carbohydrates, and oxygen
d. none of these

____ 22. Since the 1950s, experiments have been conducted that lead scientists to conclude that life may have originated _____.
a. spontaneously as originally thought
b. in small pools of water where amino acids could be concentrated
c. in other parts of the universe
d. when prokaryotes joined together to make the first eukaryotic cell

____ 23. Scientists agree that two developments must have occurred for life to come into being: the formation of simple organic molecules important to life and _____.
a. development of prokaryotic cells in early oceans
b. organization of molecules into complex organic molecules
c. appearance of amino acids, monosaccharides, and lipids
d. an atmosphere rich in water vapor, oxygen, and ATP

____ 24. Before biogenesis became an accepted cornerstone of biology, it was widely accepted that _____.
a. living things could arise spontaneously from other living things
b. Francesco Redi and Louis Pasteur would be unable to test the current beliefs
c. flies could be produced only from other flies
d. maggots were the immature offspring of flies

____ 25. Humans are thought to have evolved during the _____ Era.
a. Cenozoic
b. Paleozoic
c. Mesozoic
d. Precambrian

____ 26. The Geologic Time Scale begins at the formation of Earth approximately _____ years ago.
a. 4.6 thousand
b. 4.6 million
c. 46 million
d. 4.6 billion

____ 27. Which of the following statements are true about fossils?
a. Fossils are usually found in sedimentary rock layers.
b. There are many different ways that fossils can be formed.
c. Fossil insects that were trapped in ice or hardened into amber.
d. all of these

____ 28. Which of the following fossils are not found in sedimentary rock?
a. imprints
b. frozen mammoths
c. amber
d. petrified wood

____ 29. While looking for fossils on an eroded hillside, you discover fossil coral and fish in one layer. In a layer just above, you find the fossil imprint of a fern frond and some fossil moss. Assuming the rock has not been disturbed, which of the following is the most probable conclusion?
a. The area had been a sea until recent times.
b. A forest had once grown there but had become submerged by water.
c. A sea had been replaced by land in ancient times.
d. A saltwater sea had changed to a freshwater lake in ancient times.

____ 30. According to one theory, the first prokaryotes probably obtained their food _____.
a. through the synthesis of organic molecules from inorganic molecules
b. through a combination of photosynthesis and aerobic respiration
c. by eating carbohydrates formed by autotrophs
d. by consuming organic molecules available in their environment

____ 31. Which group of organisms is believed to have been the earliest to evolve?
a. land plants
b. cyanobacteria
c. aquatic dinosaurs
d. mammals

____ 32. Which fact is the basis for using the fossil record as evidence that evolution has taken place?
a. In undisturbed layers of rock strata, the older fossils are found in the deeper layers.
b. There are fossils of all life-forms to be found in rock layers.
c. All fossils were formed at the same time.
d. Fossils have been shown to provide a complete record of human evolution.

____ 33. A clear fish imprint in a rock indicates that the rock is probably _____.
a. volcanic
b. sedimentary
c. metamorphic
d. igneous

____ 34. Urey and Miller subjected water, ammonia, methane, and hydrogen to heating and cooling cycles and jolts of electricity in an attempt to _____.
a. determine how the dinosaurs became extinct
b. form complex organic compounds
c. determine the age of microfossils
d. find out how ozone forms in the atmosphere

____ 35. Which event contributed most directly to the evidence of aerobic organisms?
a. an increase in the concentration of methane in the ancient atmosphere
b. a decrease in the sun's light intensity
c. the presence of organisms able to carry on photosynthesis
d. an increase in the number of organisms carrying on fermentation

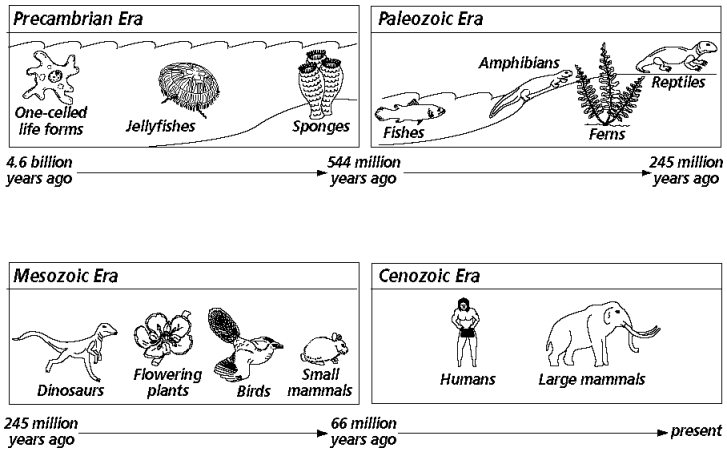



**Figure 14-4**

____ 36. According to Figure 14-4, what was the earliest form of multicellular life on Earth?
a. fish
b. invertebrates
c. land plants
d. reptiles

____ 37. According to Figure 14-4, the correct chronological order of organisms as they develop are _____.
a. birds, dinosaurs, jawed fish, prokaryotes
b. dinosaurs, jawed fish, birds, prokaryotes
c. jawed fish, dinosaurs, prokaryotes, birds
d. prokaryotes, jawed fish, dinosaurs, birds

____ 38. According to Figure 14-4, in how many eras have mammals existed?
a. 2
b. 4
c. 5
d. 7

**Completion**
*Complete each statement.*

39. Structures called _____, capable of growth and metabolism, have been produced in the laboratory. Structures like these may have eventually evolved into heterotrophic prokaryotes.
40. Organisms known as _____ are chemosynthetic autotrophs that survive in harsh conditions where there is little sunlight or oxygen.
41. The ancient belief that nonliving materials could be transformed into living organisms was referred to as _____.
42. The idea that life arises only from life is referred to as _____.

**Short Answer**

43. Explain how the evolution of photosynthetic organisms helped protect life from the sun's ultraviolet radiation.
44. Explain the relationship between early photosynthetic autotrophs and the eventual rise of aerobic life-forms.
45. How did Stanley Miller and Harold Urey's experiments affect modern ideas about the origin of life on Earth?
46. How did Francesco Redi and Louis Pasteur support the concept of biogenesis with their experiments?
47. How do scientists learn about organisms of the past when studying fossils?
48. Discuss four types of fossils and how they are formed.

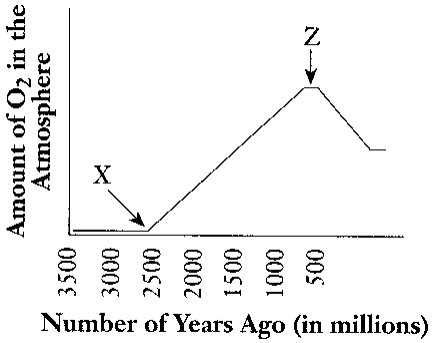



**Figure 14-3**

49. What major evolutionary event occurred at the point on the graph indicated by Z in Figure 14-3?
50. How did the evolution of photoautotrophs affect the level of oxygen in the atmosphere?
51. Describe what major event occurred in the evolution of life on Earth at point X, which is directly related to the change in the graph in Figure 14-3.

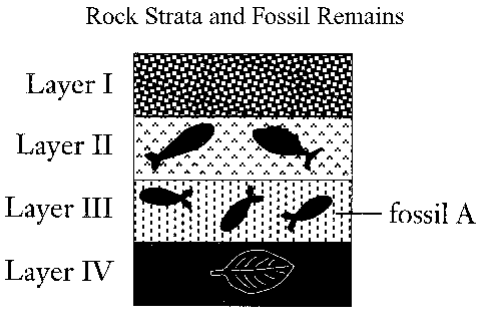



**Figure 14-2**

52. Based on the fossil record shown in Figure 14-2, explain what has happened to the type of habitat found in the area as time passed.

53. Assuming that the oldest of the strata in Figure 14-2 is layer IV and that the youngest is layer I, name and describe two techniques that could be used to determine the age of fossil A.

**Problem**

Radioactive isotopes, atoms with unstable nuclei, decay over time, giving off radiation as they break down. The decay rate of every radioactive element is known; moreover, radioactive decay continues at a steady rate. Scientists compare the amount of the original radioactive element to the amount of the new element present, which has formed as a result of the decay. Suppose that you start with 100 g of a certain radioisotope that decays to half its original amount in 50 000 years.

| Amount of Parent Material | Amount of Daughter Material | Years Passed |
|---|---|---|
| 100 grams | 0 grams | 0 |
| | | 50 000 |
| | | 100 000 |
| | | 150 000 |
| | | 200 000 |
| 3.125 grams | 96.875 grams | 250 000 |

**Table 14-1**

54. On the grid in Figure 14-1, graph the data in Table 14-1 in order to show the relationship between the passage of time and the amount of original radioisotope. Then, place an X on the graph to indicate the point at which modern humans first appeared on Earth. Consider time 0 as that point at which the decay of the full amount of the isotope begins. The 250 000-year point is the present time.

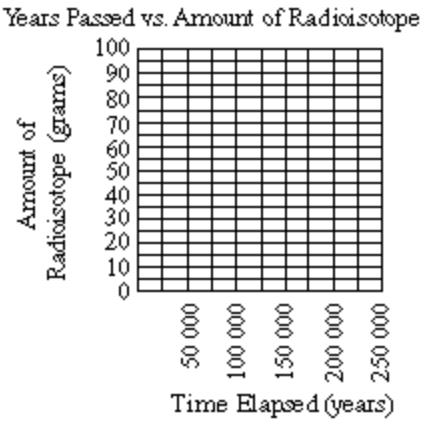



**Figure 14-1**

55. Complete Table 14-1 so that the amount of parent material (original radioisotope) and the amount of daughter material (nonradioactive end product) are correct for the number of years passed.

## Q2W1-Qs Bank- History of life
## Answer Section

### TRUE/FALSE

1. ANS: T PTS: 1
2. ANS: F PTS: 1
3. ANS: T PTS: 1
4. ANS: T PTS: 1
5. ANS: F PTS: 1

### MATCHING

6. ANS: C PTS: 1
7. ANS: E PTS: 1
8. ANS: A PTS: 1
9. ANS: F PTS: 1
10. ANS: B PTS: 1
11. ANS: G PTS: 1
12. ANS: D PTS: 1

### ESSAY

13. ANS:
    If rock layers, and the fossils they contain, have been left undisturbed, layers closer to the surface should be younger than those that are lower because they formed after and on top of the lower ones.

    PTS: 1
14. ANS:
    Relative dating will reveal only whether one fossil is older than another one.

    PTS: 1
15. ANS:
    radiometric dating

    PTS: 1
16. ANS:
    Age is determined by comparing the amount of the original radioactive element to the amount of the new element formed from decay.

    PTS: 1
17. ANS:
    The first forms of life were probably anaerobic prokaryotes that were heterotrophs.

    PTS: 1
18. ANS:

An autotroph is an organism that can make its own food. Competition for nutrients by heterotrophic prokaryotes probably led to natural selection for autotrophy.

PTS: 1

19. ANS:
Archaebacteria; many live in harsh environments and are chemosynthetic.

PTS: 1

20. ANS:
Because photosynthesis released oxygen, the concentration of that gas increased in the atmosphere.

PTS: 1

**MULTIPLE CHOICE**

21. ANS: B PTS: 1 DIF: B OBJ: 14-4
NAT: C3 | C6 | D2
22. ANS: B PTS: 1 DIF: B OBJ: 14-3
NAT: C1 | C3 | C6
23. ANS: B PTS: 1 DIF: B OBJ: 14-3
NAT: C1 | C3 | C6
24. ANS: A PTS: 1 DIF: B OBJ: 14-3
NAT: C1 | C3 | C6
25. ANS: A PTS: 1 DIF: B OBJ: 14-2
NAT: C3 | C6 | G1
26. ANS: D PTS: 1 DIF: B OBJ: 14-2
NAT: C3 | C6 | G1
27. ANS: D PTS: 1 DIF: B OBJ: 14-1
NAT: C3 | C6 | G1
28. ANS: B PTS: 1 DIF: B OBJ: 14-1
NAT: C3 | C6 | G1
29. ANS: C PTS: 1 DIF: B OBJ: 14-1
NAT: C3 | C6 | G1
30. ANS: D PTS: 1 DIF: B OBJ: 14-5
NAT: C1 | C3 | C6
31. ANS: B PTS: 1 DIF: B OBJ: 14-4
NAT: C3 | C6 | D2
32. ANS: A PTS: 1 DIF: B OBJ: 14-1
NAT: C3 | C6 | G1
33. ANS: B PTS: 1 DIF: B OBJ: 14-1
NAT: C3 | C6 | G1
34. ANS: B PTS: 1 DIF: B OBJ: 14-4
NAT: C3 | C6 | D2
35. ANS: C PTS: 1 DIF: B OBJ: 14-5
NAT: C1 | C3 | C6
36. ANS: B PTS: 1 DIF: A OBJ: 14-2
NAT: C3 | C6 | G1
37. ANS: D PTS: 1 DIF: A OBJ: 14-2

NAT: C3 | C6 | G1

38. ANS: A PTS: 1 DIF: A OBJ: 14-2
NAT: C3 | C6 | G1

**COMPLETION**

39. ANS: protocells

PTS: 1 DIF: B OBJ: 14-4 NAT: C3 | C6 | D2

40. ANS: archaebacteria

PTS: 1 DIF: B OBJ: 14-5 NAT: C1 | C3 | C6

41. ANS: spontaneous generation

PTS: 1 DIF: B OBJ: 14-4 NAT: C3 | C6 | D2

42. ANS: biogenesis

PTS: 1 DIF: B OBJ: 14-3 NAT: C1 | C3 | C6

**SHORT ANSWER**

43. ANS:
Photosynthetic organisms gave off $O_2$. Lightning converted some of the atmospheric oxygen into ozone ($O_3$). The ozone eventually built up a layer, which shields Earth's surface from the damaging effects of ultraviolet radiation.

PTS: 1 DIF: A OBJ: 14-5 NAT: C1 | C3 | C6

44. ANS:
The photoautotrophs released oxygen, which was missing from the ancient atmosphere and necessary for aerobic respiration. Thus, the autotrophs produced the $O_2$ needed for the aerobic organisms to evolve.

PTS: 1 DIF: A OBJ: 14-5 NAT: C1 | C3 | C6

45. ANS:
Miller and Urey's experiments supported the proposed and widely accepted hypothesis by Alexander Oparin that life began in the early oceans. Using a model of the primitive Earth atmosphere, oceans, and climatic conditions, Miller and Urey produced amino acids and other organic compounds. This demonstrated that the formation of life was possible establishing a foundation for the modern theories.

PTS: 1 DIF: A OBJ: 14-4 NAT: C3 | C6 | D2

46. ANS:
Biogenesis is the idea that living things come only from other living things. Redi proved that large organisms, such as flies, do not spontaneously appear as had been previously thought. Pasteur took Redi's work even further and showed by experiments with broth that even bacteria do not spontaneously arise.

PTS: 1 DIF: A OBJ: 14-3 NAT: C1 | C3 | C6

47. ANS:

Scientists identify different kinds of fossils found in sedimentary rock layers. From the way the rock is formed, the scientists can determine approximately when the organism lived and what the climate was like. By observing many different layers, conclusions can be drawn about the evolution of certain organisms from their fossils.

PTS: 1 DIF: A OBJ: 14-1 NAT: C3 | C6 | G1

48. ANS:
Answers will vary. Insects, plants, and small animals may be preserved in amber, a fossilized tree sap. Casts of organisms produce a replica of the original organism when minerals fill in a mold created by the organism. Trace fossils are the markings or evidence of animal activities, such as footprints and trails. The hard parts of organisms may be fossilized and replaced by minerals, creating a stone copy.

PTS: 1 DIF: A OBJ: 14-1 NAT: C3 | C6 | G1

49. ANS:
At this stage in Earth's history, aerobic organisms evolved.

PTS: 1 DIF: A OBJ: 14-2 NAT: C3 | C6 | G1

50. ANS:
Photoautotrophs released $O_2$ into the atmosphere. Prior to that, there was no large source of atmospheric oxygen.

PTS: 1 DIF: A OBJ: 14-2 NAT: C3 | C6 | G1

51. ANS:
Photoautotrophs evolved and released $O_2$ into the atmosphere.

PTS: 1 DIF: A OBJ: 14-2 NAT: C3 | C6 | G1

52. ANS:
The leaf fossils in layer IV would indicate that this area was dry land with plants growing. The fish fossils in layers III and II indicate that the area was later under water and supported aquatic life. Layer I has no visible fossils. This could indicate that the area was a desert with little life and no water present to allow large numbers of fossils to form. Or, the conditions in the area did not allow the formation of fossils.

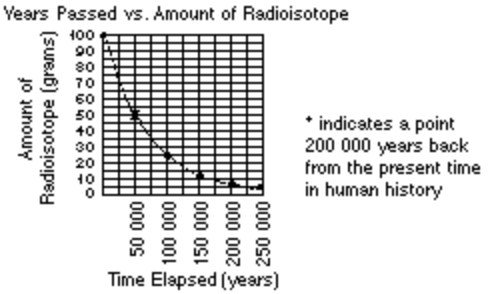
PTS: 1 DIF: A OBJ: 14-1 NAT: C3 | C6 | G1

53. ANS:
In order to determine the age of fossil A, scientists could use an absolute dating technique called radiometric dating. It relies on the rate at which unstable radioactive nuclei break down and, over time, give off radiation and eventually become different, stable elements. The ratio of the amount of unstable radioisotopes to the amount of the stable end product allows scientists to calculate how much time has passed since the fish was alive. Another method, relative dating, relies on scientists knowing the age of fossils above, below, or within the same layer as the unknown specimen. The age of fossil A can then be estimated.

PTS: 1 DIF: A OBJ: 14-1 NAT: C3 | C6 | G1

**PROBLEM**

54. ANS:
See Solution 14-1.




**Solution 14-1**

PTS: 1 DIF: A OBJ: 14-1 NAT: C3 | C6 | G1

55. ANS:

| Amount of Parent Material | Amount of Daughter Material | Years Passed |
|---|---|---|
| 100 grams | 0 grams | 0 |
| 50 grams | 50 grams | 50 000 |
| 25 grams | 75 grams | 100 000 |
| 12.5 grams | 87.5 grams | 150 000 |
| 6.25 grams | 93.75 grams | 200 000 |
| 3.125 grams | 96.875 grams | 250 000 |

**Table 14-1**

PTS: 1 DIF: A OBJ: 14-2 NAT: C3 | C6 | G1