Evolution Unit Practice Test

Modified True/False

Indicate whether the statement is true or false. If false, change the identified word or phrase to make the statement true.

____ 1. After his voyage on the *Beagle*, Charles Darwin wondered whether similar species from the Galápagos Islands could once have been members of the same species. ___________________________

____ 2. Charles Darwin noted that members of a population are identical. ___________________________

____ 3. According to Lamarck, geological forces acting today are the same ones that have been acting in the past. ___________________________

____ 4. In Charles Darwin's time, many people thought that Earth and its living things were formed about a few thousand years ago. ___________________________

____ 5. Evidence that the surface of a mountain was once under the sea includes the presence of marine fossils on the mountain. ___________________________

____ 6. According to Lamarck's hypothesis, an organism could change parts of its genotype and pass those changes to its offspring. ___________________________

____ 7. Lyell hypothesized that human populations are kept in check by war, famine or starvation, and disease. ___________________________

____ 8. Artificial selection as practiced by farmers is also called selective breeding. ___________________________

____ 9. In natural selection, humans, rather than the environment, select the variations of traits to be passed to offspring. _________________________________

____ 10. According to the concept of natural variation, living and extinct species evolved from the same ancestors. _________________________________

____ 11. The way that living and fossil species are distributed form patterns of geography that help explain the relationships among species. ___________________________

____ 12. The discovery of a dinosaur fossil with wings and feathers connects birds to their ancient ancestors. ___________________________

____ 13. The wings of birds and the flippers of dolphins are vestigial structures. _________________________________

____ 14. When comparing the genomes of two species, the number of differences in their genetic codes can be used to estimate the time since their lineages split. ___________________________

____ 15. In their studies of Galápagos finches, the Grants studied the molecular characteristics of finches from different islands. ___________________________

____ 16. In a gene pool, as the allele frequency of one allele for a trait increases, the allele frequencies of other alleles for that trait decrease. ___________________

____ 17. Because all members of a population can interbreed, biologists often study their genes as a single group. __________________

____ 18. Most differences which can passed to offspring are due to genetic recombination that occurs during asexual reproduction. ______________________

____ 19. Mutations do not always affect an organism's phenotype—its physical, behavioral, and biochemical characteristics. _________________

____ 20. A polygenic trait is controlled by one gene.______________________

____ 21. On a graph, the distribution of phenotypes for a single-gene trait tends to form a bell-shaped curve. _____________________

____ 22. Natural selection acting on single-gene traits can lead to changes in allele frequencies. _________________________

____ 23. In a population of snakes with a range of body lengths, if the longest individuals have the highest fitness, disruptive selection is likely to occur. _________________________

____ 24. In small populations, an allele can become more or less common simply by chance. _________________________

____ 25. Genetic drift may occur when a small group of individuals colonize a new habitat. _________________________

____ 26. A lack of mutations that introduce new alleles into a population is one condition of genetic variation. _________________________

____ 27. In a population of birds, if females prefer males with long tails, the population violates the condition of directional selection described by the Hardy-Weinberg principle. _________________________

____ 28. In the type of reproductive isolation called behavioral isolation, two populations are separated by barriers such as rivers or mountains. _________________________

____ 29. Two populations that have overlapping ranges can remain reproductively isolated through behavioral isolation or temporal isolation. _________________________

____ 30. The first step towards speciation of the Galápagos finches was the arrival of founders from South America. _________________________

____ 31. The fossil record, although incomplete, provides evidence about the history of life and illustrates that most species have remained unchanged over time. _________________________

____ 32. The radioactive isotope most useful for dating fossils less than 60,000 years old is potassium-40. _________________________

____ 33. Scientists use relative dating to determine the absolute age of a rock in years. _________________________

____ 34. The vast majority of Earth's history—about 90 percent—is taken up by the Cenozoic Era. _________________________

____ 35. The Cenozoic Era includes the Cretaceous, Jurassic, and Triassic Periods. _________________________

____ 36. Impacts from comets and large meteors contributed to mass extinctions by kicking massive amounts of dust and debris into the atmosphere._________________________

____ 37. Background extinction is the normal extinction that occurs as part of natural selection.

____ 38. Scientists study radioactive elements to learn about patterns of macroevolution.

____ 39. In the punctuated equilibrium model, most new species would likely evolve during periods of rapid change. _______________________________

____ 40. Two important patterns of macroevolution are speciation and adaptation.

____ 41. The Galápagos finches underwent adaptive radiation, a process in which a small group evolves into several different forms that live in different ways. _________________________

____ 42. Under certain conditions, very small bubbles called proteinoid microspheres can form large organic molecules. _________________________

____ 43. The earliest sedimentary rocks were formed about the time that liquid water formed on Earth's surface. _________________________

____ 44. Mitochondria and chloroplasts divide the same way free-living bacteria do—by mitosis. ________________________________

____ 45. Asexual reproduction increases genetic variation—the raw material on which natural selection operates. _________________________

Completion
Complete each statement.

46. ____________________'s contribution to science was the theory of evolution by natural selection.

47. The absence of rabbits and other species commonly found in Europe from South American and Australia is an example of Darwin's observation that species vary ____________________.

48. James Hutton and Charles Lyell held similar views about Earth's age. Both thought that Earth was ____________________ of years old.

49. The geologist ____________________ proposed that past changes in Earth must be explained in terms of events and processes observable today.

50. According to Lamarck, evolution resulted from the inheritance of ____________________ traits.

51. Although his idea was incorrect, Jean-Baptiste Lamarck was one of the first people to propose a scientific explanation for ____________________.

52. When a population's birthrate exceeds its death rate, the size of the population ____________________.

53. Charles Darwin applied Thomas Malthus's thoughts about human population growth to all ____________________.

54. Natural selection occurs when organisms survive in their local environment and produce ____________________.

55. Homologous structures are evidence for Darwin's idea that all life on Earth is connected through _________________________.

56. Charles Darwin concluded that the distribution of living and extinct ____________________ around the world could provide evidence of evolution.

57. Geologists use ____________________ to determine a rock layer's absolute age.

58. Structures that have different functions in different species but develop from the same embryonic tissues are called ____________________ structures.

59. ____________________ proteins, such as cytochrome c, are found in all types of cells from one-celled yeasts to multicellular kangaroos.

60. In studying Galápagos finches, the Grants found that ____________________ can take place frequently and over relatively short periods of time.

61. A(an) ____________________ is all of the genes that are present in a particular population.

62. The passing of genes from one organism to another organism that is not its offspring is called ____________________.

63. The number of possible phenotypes for a given trait depends on how many ____________________ control the trait.

64. A polygenic trait can have many possible genotypes and ____________________.

65. The pattern of natural selection that acts most strongly against gray individuals in a population that ranges from black through gray to white is ____________________ selection.

66. When the phenotypes of polygenic traits are represented by a bell curve, the ____________________ of individuals close together on the curve is not very different.

67. In genetic drift, ____________________, not natural selection, plays an important part in determining how many descendants an organism has.

68. According to the _________________________ principle, allele frequencies in a population can be disturbed by one or more of five conditions.

69. When a population is NOT evolving, it is in a situation called ______________________.

70. For speciation to occur, populations must be ____________________ isolated from each other.

71. If two populations have been reproductively isolated and can no longer breed and produce fertile offspring, the process of _________________________ has occurred.

72. In the Galápagos finches that the Grants studied, a pattern of natural selection called ____________________ selection favored individuals with larger, heavier beaks during a drought.

73. In a particular environment, populations that are very different from each other are less likely to ____________________ with each other for resources.

74. When researchers use a molecular clock, they can estimate the time since two organisms shared a _________________.

75. A(an) ____________________ uses mutation rates in DNA to estimate the time that two species have been evolving independently.

76. In a species that has become ____________________, all members have died, and the species has ceased to exist.

77. The ____________________ record provides evidence about the history of life on Earth.

78. A researcher could quickly compare the ages of two rock samples if they both contained a(an) ____________________ fossil.

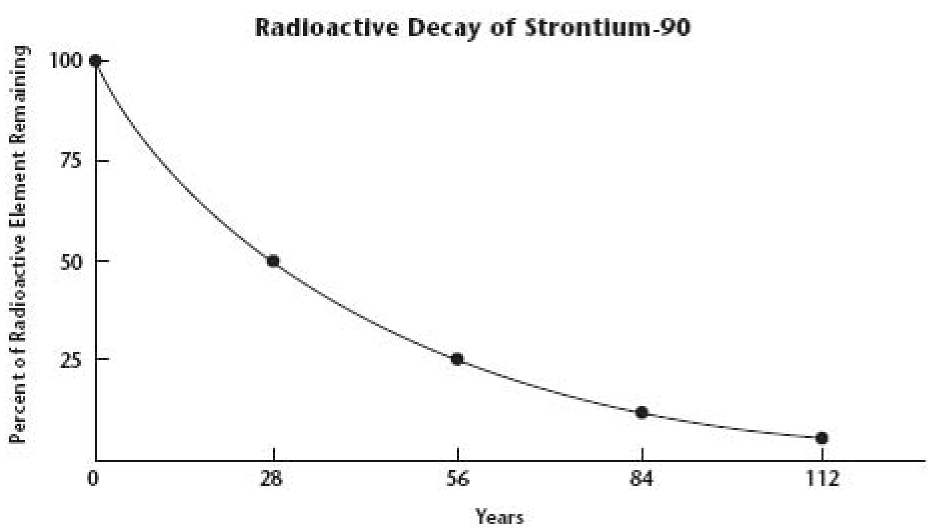


Figure 19–3

79. Look at Figure 19–3. This isotope would be a poor candidate for determining the age of fossils because it has such a short ____________________.

80. After Precambrian Time, the main divisions of the geologic time scale are eons, eras, and ____________________.

81. The process that causes some fossils to appear on more than one continent is called ____________________.

82. An event during which many types of living things suddenly die out is called a(an) ____________________.

83. A fossil species that shows a steady pattern of changes over consecutive rock layers most likely evolves through ____________________.

84. The similar body structure but different ancestry of sharks and dolphins indicates that these groups have undergone ____________________, a process in which unrelated organisms come to resemble each other.

85. ____________________ is the process by which two species evolve in response to changes in each other over time.

86. In Stanley Miller and Harold Urey's experiment, several ____________________, which are the building blocks of proteins, began to accumulate.

87. Earth's first atmosphere was composed primarily of carbon dioxide, ____________________, and water vapor.

88. ____________________ may have evolved from photosynthetic prokaryotes that moved into ancient eukaryotic cells.

89. The ____________________ theory proposes that eukaryotic cells arose from living communities of several prokaryotic organisms.

90. Most grass plants in the schoolyard have very little genetic diversity within a species. This suggests that regular mowing forces lawn grasses to reproduce ____________________.

Short Answer

91. What was the scientific value of the specimens that Charles Darwin brought back to England?

92. Summarize Charles Darwin's contribution to science.

93. What did Charles Darwin notice about some of the fossils he collected during his voyage on the *Beagle*?

94. What did Charles Darwin learn about how the land tortoises of the Galápagos Islands varied from island to island?

95. Summarize the contribution to science made by Hutton and Lyell.

96. Summarize Jean-Baptiste Lamarck's ideas about how organisms changed over time.

97. Summarize Thomas Malthus's ideas about population growth.

98. How did the farmers observed by Charles Darwin take advantage of natural variation to improve their livestock?

99. How does artificial selection differ from natural selection?

100. What are three conditions necessary for natural selection to occur?

101. What is the principle of common descent?

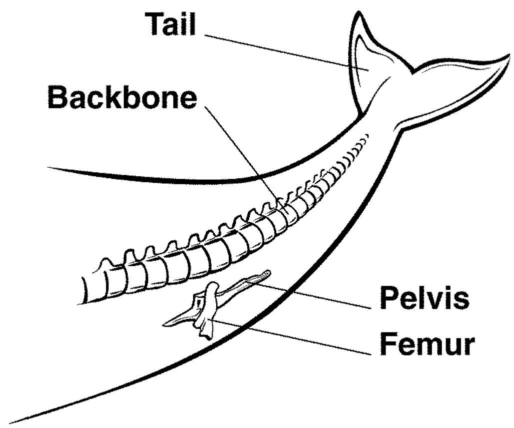


Figure 16–1

102. Many modern whales have a vestigial pelvis and femur, such as is shown in Figure 16–1. What does this evidence suggest about ancestors of modern whales?

103. What does the continued presence of vestigial structures like the whale pelvis and femur shown in Figure 16–1 suggest about the impact vestigial structures have on fitness?

104. What can be concluded from the similarity in the Hox genes that control limb development in many types of organisms?

105. What did the Grants discover about Galápagos finches?

106. Are the members of a population necessarily the same species? Explain.

107. Explain how you could calculate the allele frequency of an allele in a gene pool.

108. What are the three main sources of genetic variation? Which is most common among eukaryotes?

109. Would a trait that has only two distinct phenotypes more likely be a single-gene trait or a polygenic trait? How do you know?

110. Is an allele for a trait that has no effect on a species' fitness affected by natural selection? Explain.

111. How does the size of a population relate to genetic drift?

112. List the five conditions that can disturb genetic equilibrium in a population.

113. Why might a geographic barrier such as a large river cause the formation of a new species of small rodents but not a new species of birds?

114. What are three mechanisms for reproductive isolation? Which mechanism isolates two populations of similar frogs with different mating calls?

115. What are the major steps that were likely involved in the speciation of the Galápagos finches?

DNA Sequence of Three Species
Mutations Represented by Color Bands

Species A	G	A	T	T	C	A	A	C	G
Species B	G	A	T	C	C	A	G	C	G
Species C	G	C	T	C	C	A	A	T	G

Figure 17–4

116. How many differences are there in the DNA of the three species in Figure 17–4? What could be learned by comparing those differences?

117. What might explain the differences in the mutations of the species in Figure 17–4?

118. How can gene duplication affect evolution?

119. How can small changes in Hox genes can cause large changes in organisms?

120. What might happen when a Hox gene turns other genes on or off?

121. Why is the fossil record an incomplete history of life?

122. What are two kinds of information that scientists attempt to infer from the study of fossils?

123. What information does relative dating provide?

124. What can you infer about the relative ages of two fairly young fossils if fossil A has a greater amount of carbon-12 compared to carbon-14 than does fossil B?

125. Why are the divisions of geologic time NOT standard lengths, such as 100 million years?

126. Within the clade Reptilia, whole clades have become extinct. Do you think Reptilia itself will eventually become extinct? Explain your answer.

127. What is the difference between background extinction and mass extinction?

128. Explain how the Galápagos finches illustrate adaptive radiation.

129. What are two important macroevolutionary patterns?

130. A pollinator species for a particular flowering plant undergoes a mutation that prevents it from seeing the plant's dominant flower color. How might the plant evolve in response to the pollinator's loss of color sight?

131. Why did oceans not exist on Earth 4 billion years ago?

132. When they conducted their famous experiments, Stanley Miller and Harold Urey made certain that no microorganisms contaminated their lab equipment. Why might microorganisms have harmed the accuracy of their result?

133. What role did microscopes play in the origin of the endosymbiotic theory more than 100 years ago?

134. Explain how living organisms changed the environment during Earth's early years.

135. Gardeners often reproduce favorite plants by planting cuttings from the plant instead of seeds. Is this sexual or asexual reproduction? How would this process affect the genetic diversity of the garden population?

Other

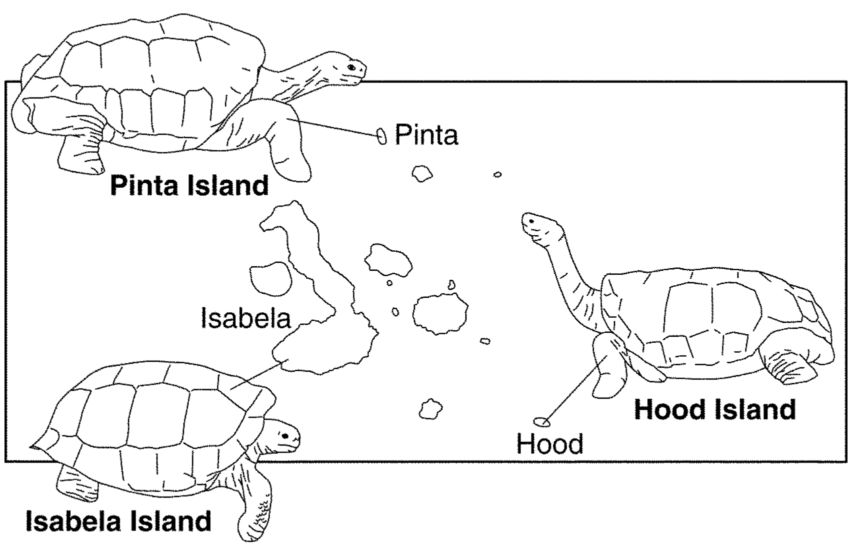


Figure 16–2

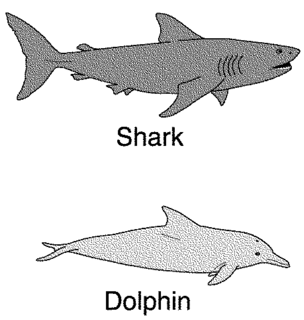
136. **Interpret Visuals** What adaptation is apparent in the bodies of the three tortoise species shown in Figure 16–2?

137. **Interpret Visuals** Which of the tortoises shown in Figure 16–2 has the longest neck?

138. **Infer** Vegetation on Hood Island is sparse and sometimes hard to reach. How might the vegetation have affected the evolution of the Hood Island tortoise shown in Figure 16–2?

139. **Form a Hypothesis** Considering the body structure of the tortoises shown in Figure 16–2, which tortoises—a population from Pinta Island or a population from Isabela Island—might survive more successfully on Hood Island? Why?

140. **Apply Concepts** Can you tell from Figure 16–2 how closely the three tortoise species resemble the ancestral species? Why or why not?



Comparison of Two Vertebrates		
Characteristics	**Shark**	**Dolphin**
Habitat	Ocean	Ocean
Type of Vertebrate	Fish	Mammal
Composition of Skeleton	Cartilage	Bone
Type of Teeth	Large numbers of sharp teeth	Large numbers of sharp teeth
Respiration	Breathes in water	Breathes in air

Figure 16–3

141. **Compare and Contrast** In Figure 16–3, sharks and dolphins belong to different vertebrate groups and are not closely related. How can Darwin's ideas about evolution help explain their similar appearance?

142. **Apply Concepts** Charles Darwin would say that sharks like the one in Figure 16–3 exhibit fitness. Explain what that means, and discuss two specific adaptations as part of your explanation.

143. **Apply Concepts** Fossil evidence indicates that dolphins evolved from ancestors that walked on land. How can the concept of natural selection be used to explain the evolution of the present-day dolphin body, as seen in Figure 16–3?

144. **Predict** Suppose a dolphin population, like those in Figure 16–3, becomes trapped in a harbor that is growing smaller and more shallow because of climate changes. Is it likely that the dolphins would evolve into a land-dwelling species in a few thousand years? Explain your answer.

145. **Infer** Based on Figure 16–3, if you wanted to find out whether sharks and dolphins share homologous structures, what structures would you examine? Explain.

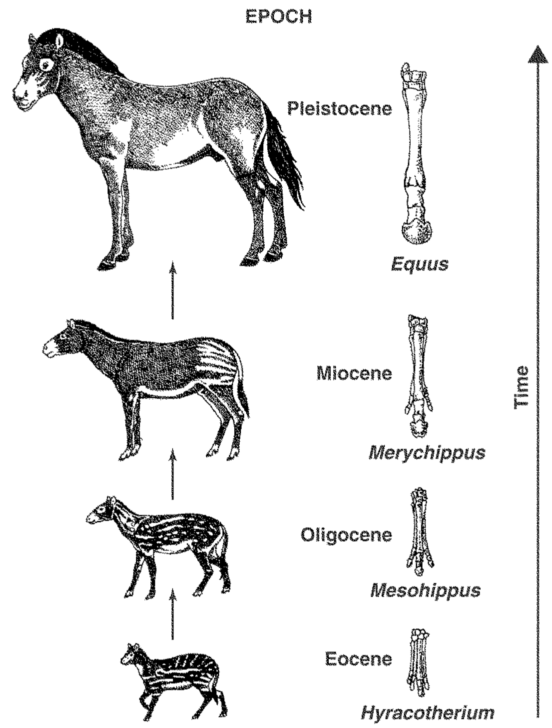


Figure 16–4

146. **Infer** Scientists have never seen the ancient horses shown in Figure 16–4. What do you think was the main type of evidence scientists used to prepare these diagrams?

147. **Interpret Visuals** According to Figure 16–4, how did overall body size of the horse change during its evolution?

148. **Observe** In Figure 16–4, how does the size of the head change as the horse evolves?

149. **Compare and Contrast** According to Figure 16–4, how did the number of toes of *Mesohippus* compare with that of *Equus*, the modern horse?

150. **Infer** Does Figure 16–4 show that all species get much larger as they evolve?

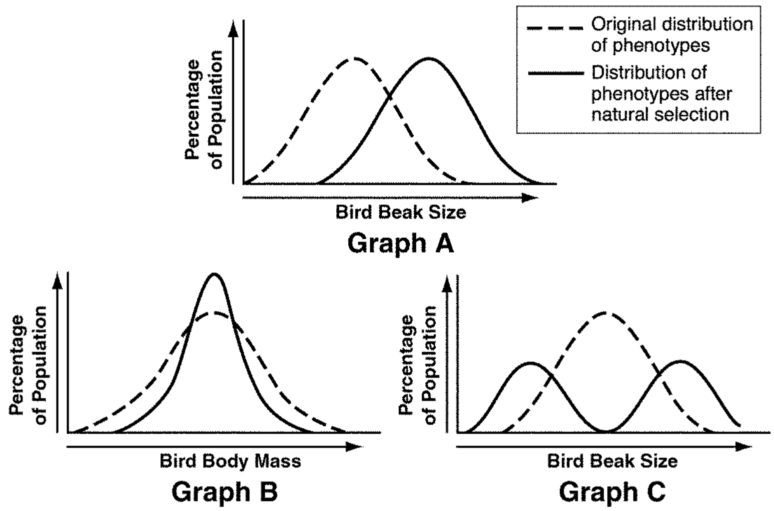


Figure 17–5

151. **Interpret Graphs** According to Graph A in Figure 17–5, what has occurred?

152. **Interpret Graphs** According to Graph B in Figure 17–5, what has occurred?

153. **Interpret Graphs** According to Graph C in Figure 17–5, what has occurred?

154. **Infer** Which of the three graphs shown in Figure 17–5 might show a population of birds with members that specialize in different types of food? Explain.

155. **Infer** What factors or conditions might have led to the change shown in Graph A of Figure 17–5?

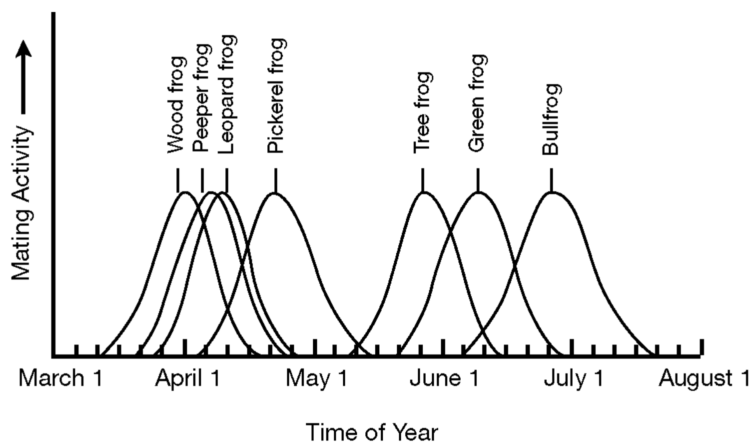


Figure 17–6

156. **Interpret Graphs** Describe the information about frog species that is shown in Figure 17–6.

157. **Interpret Graphs** According to Figure 17–6, there is a brief period during which frog mating nearly stops. When does this occur?

158. **Infer** Based on Figure 17–6, what mechanism appears to keep bullfrogs reproductively isolated? Would that mechanism necessarily be the only isolating mechanism? Explain.

159. **Infer** Peeper frogs and leopard frogs do not interbreed even when they share a habitat. Use the information in Figure 17–6 to determine what mechanism probably keeps the two species reproductively isolated.

160. **Predict** Frog mating does not occur in cold weather. Assume that the mating times shown in Figure 17–6 are for frogs in the northern part of the United States. How might these curves change for frogs in the southern part of the United States? Explain.

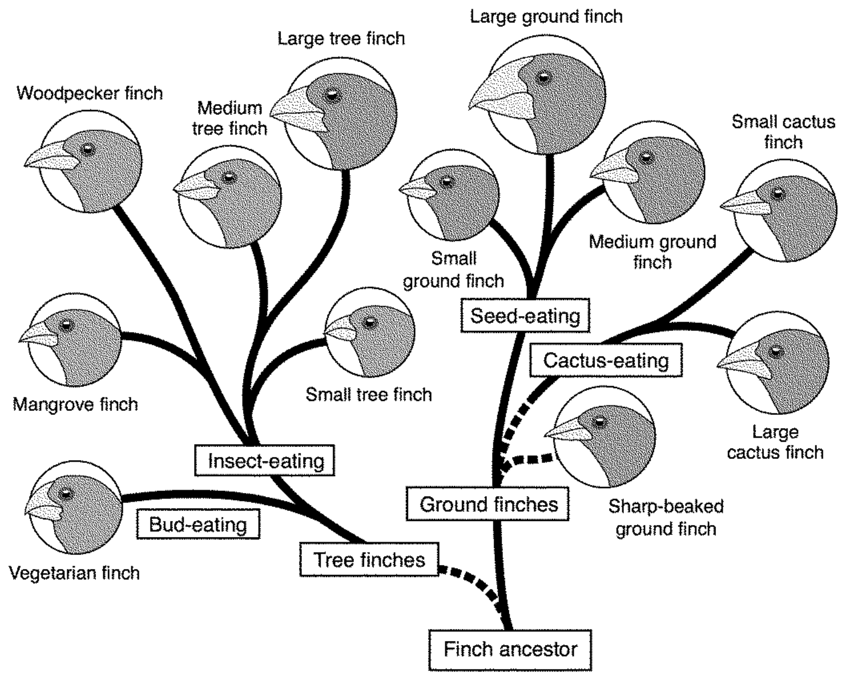


Figure 17–7

161. **Apply Concepts** Explain what speciation means using examples from Figure 17–7.

162. **Design an Experiment** Suppose that researchers suspected that two groups shown in Figure 17–7 were actually a single species. How might the researchers test that hypothesis?

163. **Apply Concepts** Darwin's finches in Figure 17–7 were found on one or more of the Galápagos Islands. How might the island geography have affected the evolution of these species?

164. **Form a Hypothesis** Examine Figure 17–7 and observe the large ground finch and medium ground finch. Assume that the diagram shows the average type of beak for each group. If these species were formed from a single type of natural selection, which type is it most likely to be? Explain.

165. **Interpret Visuals** Competition for resources plays a key role in natural selection. Describe one way that competition for food might have influenced the evolution of the large tree finch in Figure 17–7.

Geologic Time Scale

Era	Period	End Date (in millions of years ago)	
Cenozoic	Quaternary	present	
	Neogene	1.8	
	Paleogene	23	
Mesozoic	Cretaceous	65.5	
	Jurassic	146	
	Triassic	200	
Paleozoic	Permian	251	
	Carboniferous	299	
	Devonian	359	
	Silurian	416	
	Ordovician	444	
	Cambrian	448	

Figure 19–4

166. **Interpret Tables** How many geologic periods are shown in Figure 19–4, and which one is the earliest?

167. **Apply Concepts** The Paleozoic Era ended with the disappearance of many land and aquatic species. What is that type of event called? Use Figure 19–4 to name the period in which that event took place.

168. **Interpret Tables** The end of the Mesozoic Era marks the extinction of dinosaurs. Based on Figure 19–4, how long ago did the dinosaurs become extinct?

169. **Calculate** Use Figure 19–4 to determine how many years the Silurian Period lasted.

170. **Interpret Tables** The first marsupials, a group that includes the modern kangaroo, evolved about 100 million years ago. According to Figure 19–4, during which geologic period did marsupials evolve?

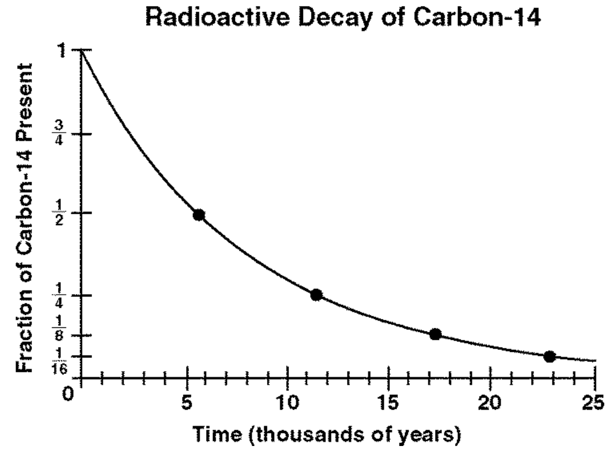


Figure 19–5

171. **Interpret Graphs** Use Figure 19–5 to determine the approximate half-life of carbon-14.

172. **Interpret Graphs** A fossil bone was found to contain about one sixteenth of the amount of carbon-14 that was originally present. Use Figure 19–5 to determine the approximate age of the bone.

173. **Infer** According to Figure 19–5, 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.

174. **Interpret Graphs** According to Figure 19–5, how many half-lives have passed if a fossil has one eighth of its original amount of carbon-14?

175. **Predict** As carbon-14 decays, it changes to nitrogen-14, which is released as a gas. Refer to Figure 19–5 to predict how the amount of nitrogen gas produced would change over the period of radioactive decay. Why does that change take place?

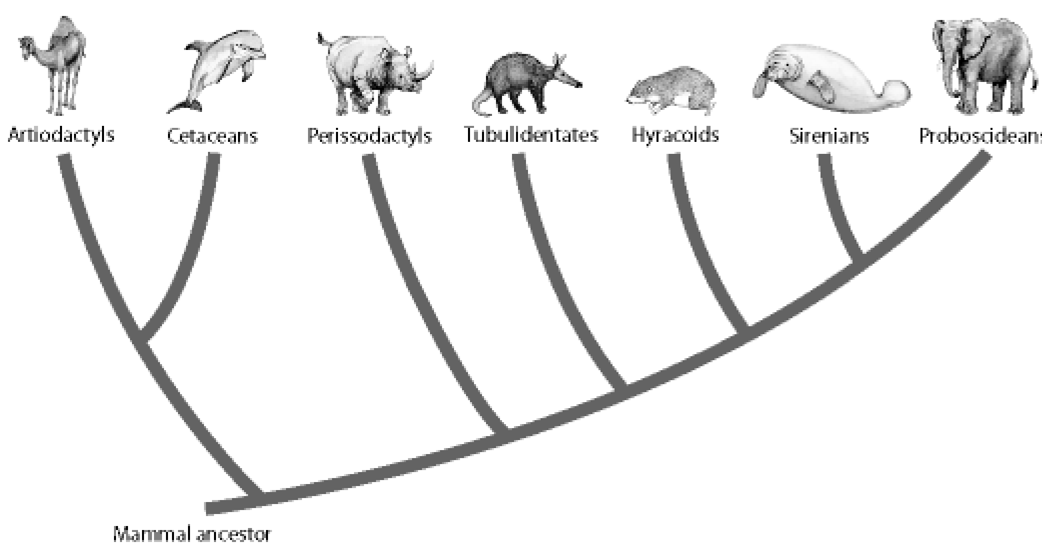


Figure 19–6

176. **Interpret Visuals** The evolutionary tree in Figure 19–6 shows relationships among several mammal species. Which group of modern mammals is the most closely related to elephants (Proboscideans)?

177. **Interpret Visuals** Which group of animals has existed the longest in Figure 19–6? How do you know?

178. **Apply Concepts** In Figure 19–6, are the different groups the result of convergent evolution or adaptive radiation? How do you know?

179. **Predict** Study Figure 19–6. How would you expect this evolutionary tree to look thousands of years from now? Why?

180. **Infer** What do you think was most responsible for the amount of diversity in the groups shown in Figure 19–3? Explain your answer.

Essay

181. What was Charles Darwin's contribution to science, and how did he develop it?

182. What sources of evidence contributed to Charles Darwin's presentation of his concept of evolution by natural selection?

183. Explain how Darwin noticed that different animals that lived in similar habitats existed around the world.

184. Discuss Jean-Baptiste Lamarck's contribution to the overall theory of evolution.

185. How did Thomas Malthus's ideas about human population growth inspire Darwin's thinking about evolution?

186. Explain how the finches and tortoises that Charles Darwin observed on the Galápagos Islands influenced his thinking.

187. How was Darwin's concept of natural selection influenced by the practices of English farmers?

188. Suppose a plant breeder selectively breeds a plant for its bright red flower and creates a new population with little variation. Would the new population survive if it were released into the wild? Explain.

189. What might happen if a well-adapted population experienced sudden major changes in its environment?

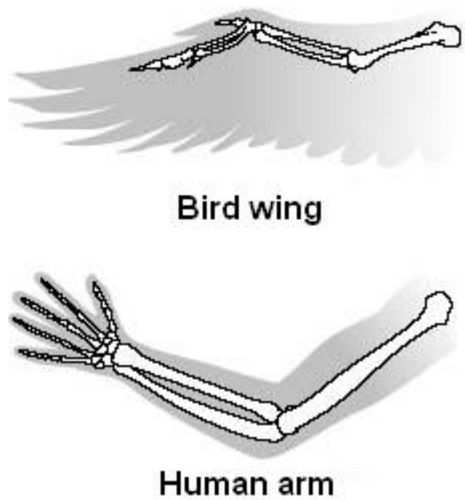


Figure 16–5

190. How is the idea of common descent supported by examples of homologous structures as shown in Figure 16–5?

191. For a trait that has many different alleles, would an individual in the population be more likely to have that allele if it has a low allele frequency or a high allele frequency? Why?

192. Define *mutation* and describe one situation in which a mutation changes an organism's phenotype in a way that affects fitness and another situation in which a mutation would not affect an organism's fitness.

193. For a population, are the frequencies of phenotypes for a single-gene trait best expressed by a bar graph or a curve? Are the frequencies of phenotypes for a polygenic trait best expressed by a bar graph or a curve? Explain.

194. Describe the founder effect, and describe the conditions in which it arises.

195. The Hardy-Weinberg principle describes the conditions that can change the frequency of alleles in a population. Explain how that change occurs.

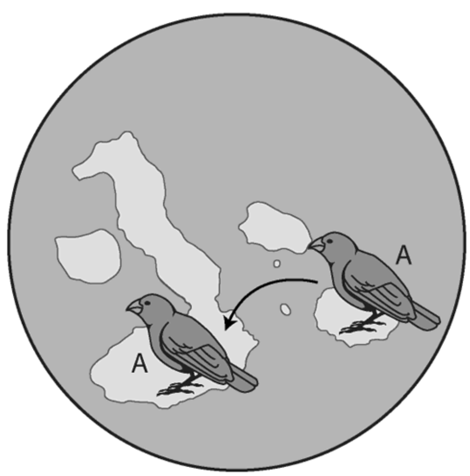


Figure 17–8

196. Assume that a single population becomes split by migration across a geographic barrier that divides two very different ecosystems, as is shown in Figure 17–8. What would likely happen to the two separated populations? Would this process occur more quickly, less quickly, or at the same rate as it would if the two populations lived in similar ecosystems?

197. If each of the Galápagos Islands had contained an identical assortment and abundance of vegetation, would the impact of natural selection have been as pronounced as it was? Explain.

198. Why are neutral mutations useful for molecular clocks?

199. Describe one way that new genes can evolve.

200. Assume that a species needs a fairly long neck to reach its food. How might Hox genes contribute to the evolution of this species?

201. Suppose that a scientist found a fossilized fish on the surface of the ground. Describe a possible set of events that could have taken place, first to form the fossil and then to situate it on the ground surface.

202. Explain the principle behind radioactive dating.

203. What is the geologic time scale and how does it relate to the fossil record?

204. Explain how physical and biological processes have shaped life on Earth.

205. Explain the processes that determine whether a clade survives or becomes extinct.

206. Darwin proposed that evolution proceeded at a slow and steady pace, a model known as gradualism. But his Galápagos finches did not follow this model. What model of evolution did they follow? Explain how the two models differ.

207. Explain the proposed relationship between an asteroid impact and the Cretaceous mass extinction.

208. Explain the hypothesis that describes Earth’s formation.

209. Define and explain the endosymbiotic theory.

210. The alga *Chlamydomonas* normally reproduces asexually. However, it switches to sexual reproduction when there is an unfavorable change in its environment. Would *Chlamydomonas* evolve more quickly in a favorable environment or an unfavorable environment? Explain your answer.

Evolution Unit Practice Test
Answer Section

MODIFIED TRUE/FALSE

1. ANS: T PTS: 1 DIF: L1
   REF: p. 451 OBJ: 16.1.1 State Charles Darwin's contribution to science.
   STA: UT.BIO.5.2.c TOP: Foundation Edition
   BLM: knowledge
2. ANS: F
   differ
   are different
   have natural variations

   PTS: 1 DIF: L2 REF: p. 452
   OBJ: 16.1.2 Describe the three patterns of biodiversity noted by Darwin.
   STA: UT.BIO.5.2.c | UT.BIO.5.2.d BLM: comprehension
3. ANS: F, Lyell

   PTS: 1 DIF: L2 REF: p. 455
   OBJ: 16.2.1 Identify the conclusions drawn by Hutton and Lyell about Earth's history.
   STA: UT.BIO.5.2.c TOP: Foundation Edition
   BLM: comprehension
4. ANS: T PTS: 1 DIF: L2
   REF: p. 454 OBJ: 16.2.1 Identify the conclusions drawn by Hutton and Lyell about Earth's history.
   STA: UT.BIO.5.2.c TOP: Foundation Edition
   BLM: comprehension
5. ANS: T PTS: 1 DIF: L2
   REF: p. 455 OBJ: 16.2.1 Identify the conclusions drawn by Hutton and Lyell about Earth's history.
   STA: UT.BIO.5.2.c BLM: application
6. ANS: F
   phenotype
   body

   PTS: 1 DIF: L2 REF: p. 456
   OBJ: 16.2.2 Describe Lamarck's hypothesis of evolution. STA: UT.BIO.5.2.c
   TOP: Foundation Edition BLM: comprehension
7. ANS: F, Malthus

   PTS: 1 DIF: L1 REF: p. 457
   OBJ: 16.2.3 Describe Malthus's view of population growth. STA: UT.BIO.5.2.c
   TOP: Foundation Edition BLM: knowledge
8. ANS: T PTS: 1 DIF: L1
   REF: p. 457 | p. 458
   OBJ: 16.2.4 Explain the role of inherited variation in artificial selection.
   STA: UT.BIO.5.1.a | UT.BIO.5.1.b TOP: Foundation Edition
   BLM: knowledge
9. ANS: F, artificial selection

PTS: 1 DIF: L2 REF: p. 458
OBJ: 16.3.1 Describe the conditions under which natural selection occurs.
STA: UT.BIO.5.1.a | UT.BIO.5.1.b | UT.BIO.5.2.d TOP: Foundation Edition
BLM: knowledge

10. ANS: F, common descent

PTS: 1 DIF: L1 REF: p. 464
OBJ: 16.3.2 Explain the principle of common descent. STA: UT.BIO.5.2.c
TOP: Foundation Edition BLM: knowledge

11. ANS: F, biogeography

PTS: 1 DIF: L2 REF: p. 465
OBJ: 16.4.1 Explain how geologic distribution of species relates to their evolutionary history.
STA: UT.BIO.5.1.a | UT.BIO.5.1.c TOP: Foundation Edition
BLM: comprehension

12. ANS: T PTS: 1 DIF: L2
REF: p. 467
OBJ: 16.4.2 Explain how fossils and the fossil record document the descent of modern species from ancient ancestors. STA: UT.BIO.5.2.a TOP: Foundation Edition
BLM: analysis

13. ANS: F, homologous

PTS: 1 DIF: L1 REF: p. 468
OBJ: 16.4.3 Describe what homologous structures and embryology suggest about the process of evolutionary change. STA: UT.BIO.5.2.a
TOP: Foundation Edition BLM: knowledge

14. ANS: T PTS: 1 DIF: L2
REF: p. 470
OBJ: 16.4.4 Explain how molecular evidence can be used to trace the process of evolution.
STA: UT.BIO.5.2.a BLM: comprehension

15. ANS: F
physical characteristics
phenotype

PTS: 1 DIF: L2 REF: p. 472
OBJ: 16.4.5 Explain the results of the Grants' investigation of adaptation in Galapagos finches.
STA: UT.BIO.5.1.b | UT.BIO.5.2.c | UT.BIO.5.2.d TOP: Foundation Edition
BLM: comprehension

16. ANS: T PTS: 1 DIF: L2
REF: p. 483 OBJ: 17.1.1 Define evolution in genetic terms.
STA: UT.BIO.5.2.b BLM: application

17. ANS: T PTS: 1 DIF: L2
REF: p. 483 OBJ: 17.1.1 Define evolution in genetic terms.
STA: UT.BIO.5.2.b BLM: comprehension

18. ANS: F, sexual

PTS: 1 DIF: L1 REF: p. 484
OBJ: 17.1.2 Identify the main sources of genetic variation in a population.
STA: UT.BIO.5.2.b TOP: Foundation Edition

BLM: knowledge

19. ANS: T PTS: 1 DIF: L2
REF: p. 484 OBJ: 17.1.2 Identify the main sources of genetic variation in a population.
STA: UT.BIO.5.2.b BLM: analysis

20. ANS: F, single-gene

PTS: 1 DIF: L1 REF: p. 485
OBJ: 17.1.3 State what determines the number of phenotypes for a trait.
STA: UT.BIO.4.2.b TOP: Foundation Edition
BLM: knowledge

21. ANS: F, polygenic

PTS: 1 DIF: L2 REF: p. 486
OBJ: 17.1.3 State what determines the number of phenotypes for a trait.
STA: UT.BIO.4.2.b TOP: Foundation Edition
BLM: application

22. ANS: T PTS: 1 DIF: L1
REF: p. 488 OBJ: 17.2.1 Explain how natural selection affects single-gene and polygenic traits.
STA: UT.BIO.5.1.b TOP: Foundation Edition
BLM: knowledge

23. ANS: F, directional

PTS: 1 DIF: L3 REF: p. 489
OBJ: 17.2.1 Explain how natural selection affects single-gene and polygenic traits.
STA: UT.BIO.5.1.b TOP: Foundation Edition
BLM: evaluation

24. ANS: T PTS: 1 DIF: L1
REF: p. 490 OBJ: 17.2.2 Describe genetic drift. STA: UT.BIO.5.1.c
TOP: Foundation Edition BLM: knowledge

25. ANS: T PTS: 1 DIF: L2
REF: p. 490 OBJ: 17.2.2 Describe genetic drift. STA: UT.BIO.5.1.c
TOP: Foundation Edition BLM: application

26. ANS: F, equilibrium

PTS: 1 DIF: L2 REF: p. 491
OBJ: 17.2.3 Explain how different factors affect genetic equilibrium.
STA: UT.BIO.4.1.b TOP: Foundation Edition
BLM: comprehension

27. ANS: F, non-random mating

PTS: 1 DIF: L3 REF: p. 492
OBJ: 17.2.3 Explain how different factors affect genetic equilibrium.
STA: UT.BIO.4.1.b TOP: Foundation Edition
BLM: evaluation

28. ANS: F, geographic

PTS: 1 DIF: L2 REF: p. 495
OBJ: 17.3.1 Identify the types of isolation that can lead to the formation of new species.
STA: UT.BIO.5.1.c TOP: Foundation Edition
BLM: application

29. ANS: T PTS: 1 DIF: L2
REF: p. 495
OBJ: 17.3.1 Identify the types of isolation that can lead to the formation of new species.
STA: UT.BIO.5.1.c TOP: Foundation Edition
BLM: analysis

30. ANS: T PTS: 1 DIF: L1
REF: p. 496 OBJ: 17.3.2 Describe the current hypothesis about Galapagos finch speciation.
STA: UT.BIO.5.1.c | UT.BIO.5.2.d TOP: Foundation Edition
BLM: knowledge

31. ANS: F
changed
evolved

PTS: 1 DIF: L2 REF: p. 539
OBJ: 19.1.1 Explain what information fossils can reveal about ancient life.
STA: UT.BIO.5.2.a BLM: comprehension

32. ANS: F, carbon-14

PTS: 1 DIF: L2 REF: p. 541
OBJ: 19.1.2 Differentiate between relative dating and radiometric dating.
STA: UT.BIO.5.2.a TOP: Foundation Edition
BLM: application

33. ANS: F, radioactive

PTS: 1 DIF: L2 REF: p. 541
OBJ: 19.1.2 Differentiate between relative dating and radiometric dating.
STA: UT.BIO.5.2.a TOP: Foundation Edition
BLM: comprehension

34. ANS: F, Precambrian Time

PTS: 1 DIF: L1 REF: p. 543
OBJ: 19.1.3 Identify the divisions of the geologic time scale. STA: UT.BIO.5.2.a
TOP: Foundation Edition BLM: knowledge

35. ANS: F, Mesozoic

PTS: 1 DIF: L2 REF: p. 421
OBJ: 19.1.3 Identify the divisions of the geologic time scale. STA: UT.BIO.5.2.a
BLM: knowledge

36. ANS: T PTS: 1 DIF: L1
REF: p. 544
OBJ: 19.1.4 Describe how environmental processes and living things have shaped life on Earth.
STA: UT.BIO.5.1.a TOP: Foundation Edition
BLM: knowledge

37. ANS: T PTS: 1 DIF: L1
REF: p. 548
OBJ: 19.2.1 Identify the processes that influence survival or extinction of a species or clade.
STA: UT.BIO.5.1.a | UT.BIO.5.2.a TOP: Foundation Edition
BLM: knowledge

38. ANS: F, fossils

PTS: 1 DIF: L3 REF: p. 546
OBJ: 19.2.1 Identify the processes that influence survival or extinction of a species or clade.
STA: UT.BIO.5.1.a | UT.BIO.5.2.a TOP: Foundation Edition
BLM: application

39. ANS: T PTS: 1 DIF: L3
REF: p. 549 OBJ: 19.2.2 Contrast gradualism and punctuated equilibrium.
STA: UT.BIO.5.2.a TOP: Foundation Edition
BLM: application

40. ANS: F, extinction

PTS: 1 DIF: L1 REF: p. 546
OBJ: 19.2.3 Name two important patterns in macroevolution. STA: UT.BIO.5.1.b | UT.BIO.5.2.a
TOP: Foundation Edition BLM: knowledge

41. ANS: T PTS: 1 DIF: L2
REF: p. 550 | p. 551 OBJ: 19.2.3 Name two important patterns in macroevolution.
STA: UT.BIO.5.1.b | UT.BIO.5.2.a TOP: Foundation Edition
BLM: application

42. ANS: T PTS: 1 DIF: L2
REF: p. 554 OBJ: 19.3.1 Identify some of the hypotheses about early Earth and the origin of life.
STA: UT.BIO.2.1.a TOP: Foundation Edition
BLM: comprehension

43. ANS: T PTS: 1 DIF: L3
REF: p. 553 OBJ: 19.3.1 Identify some of the hypotheses about early Earth and the origin of life.
STA: UT.BIO.2.1.a BLM: synthesis

44. ANS: F
binary fission
fission

PTS: 1 DIF: L3 REF: p. 557
OBJ: 19.3.2 Explain the endosymbiotic theory. STA: UT.BIO.1.3.a | UT.BIO.5.2.a
TOP: Foundation Edition BLM: comprehension

45. ANS: F, Sexual

PTS: 1 DIF: L2 REF: p. 558
OBJ: 19.3.3 Explain the significance of sexual reproduction in evolution.
STA: UT.BIO.4.1.b TOP: Foundation Edition
BLM: analysis

COMPLETION

46. ANS:
Darwin
Charles Darwin

PTS: 1 DIF: L1 REF: p. 450
OBJ: 16.1.1 State Charles Darwin's contribution to science. STA: UT.BIO.5.2.c
TOP: Foundation Edition BLM: knowledge

47. ANS:
globally

all over the world

PTS: 1 DIF: L1 REF: p. 451
OBJ: 16.1.2 Describe the three patterns of biodiversity noted by Darwin.
STA: UT.BIO.5.2.c | UT.BIO.5.2.d TOP: Foundation Edition
BLM: knowledge

48. ANS:
many millions
millions

PTS: 1 DIF: L2 REF: p. 455
OBJ: 16.2.1 Identify the conclusions drawn by Hutton and Lyell about Earth's history.
STA: UT.BIO.5.2.c TOP: Foundation Edition
BLM: comprehension

49. ANS:
Lyell
James Lyell

PTS: 1 DIF: L1 REF: p. 455
OBJ: 16.2.1 Identify the conclusions drawn by Hutton and Lyell about Earth's history.
STA: UT.BIO.5.2.c TOP: Foundation Edition
BLM: knowledge

50. ANS: acquired

PTS: 1 DIF: L1 REF: p. 456
OBJ: 16.2.2 Describe Lamarck's hypothesis of evolution. STA: UT.BIO.5.2.c
TOP: Foundation Edition BLM: knowledge

51. ANS: evolution

PTS: 1 DIF: L2 REF: p. 456
OBJ: 16.2.2 Describe Lamarck's hypothesis of evolution. STA: UT.BIO.5.2.c
TOP: Foundation Edition BLM: comprehension

52. ANS:
grows
increases

PTS: 1 DIF: L2 REF: p. 457
OBJ: 16.2.3 Describe Malthus's view of population growth. STA: UT.BIO.5.2.c
TOP: Foundation Edition BLM: comprehension

53. ANS:
organisms
living things

PTS: 1 DIF: L2 REF: p. 457
OBJ: 16.2.3 Describe Malthus's view of population growth. STA: UT.BIO.5.2.c
TOP: Foundation Edition BLM: comprehension

54. ANS:
offspring
progeny
descendants

PTS: 1 DIF: L2 REF: p. 463
OBJ: 16.3.1 Describe the conditions under which natural selection occurs.
STA: UT.BIO.5.1.a | UT.BIO.5.1.b | UT.BIO.5.2.d TOP: Foundation Edition
BLM: comprehension

55. ANS:
common descent
common ancestors

PTS: 1 DIF: L2 REF: p. 464
OBJ: 16.3.2 Explain the principle of common descent. STA: UT.BIO.5.2.c
TOP: Foundation Edition BLM: application

56. ANS:
species
organisms

PTS: 1 DIF: L2 REF: p. 465
OBJ: 16.4.1 Explain how geologic distribution of species relates to their evolutionary history.
STA: UT.BIO.5.1.a | UT.BIO.5.1.c TOP: Foundation Edition
BLM: comprehension

57. ANS:
radioactivity
radioactive dating

PTS: 1 DIF: L1 REF: p. 466
OBJ: 16.4.2 Explain how fossils and the fossil record document the descent of modern species from ancient ancestors. STA: UT.BIO.5.2.a TOP: Foundation Edition
BLM: knowledge

58. ANS: homologous

PTS: 1 DIF: L2 REF: p. 468
OBJ: 16.4.3 Describe what homologous structures and embryology suggest about the process of evolutionary change. STA: UT.BIO.5.2.a
TOP: Foundation Edition BLM: comprehension

59. ANS: Homologous

PTS: 1 DIF: L2 REF: p. 471
OBJ: 16.4.4 Explain how molecular evidence can be used to trace the process of evolution.
STA: UT.BIO.5.2.a BLM: comprehension

60. ANS:
natural selection
adaptation

PTS: 1 DIF: L2 REF: p. 472
OBJ: 16.4.5 Explain the results of the Grants' investigation of adaptation in Galapagos finches.
STA: UT.BIO.5.1.b | UT.BIO.5.2.c | UT.BIO.5.2.d TOP: Foundation Edition
BLM: application

61. ANS: gene pool

PTS: 1 DIF: L1 REF: p. 483

OBJ: 17.1.1 Define evolution in genetic terms. STA: UT.BIO.5.2.b
TOP: Foundation Edition BLM: knowledge

62. ANS: lateral gene transfer.

PTS: 1 DIF: L2 REF: p. 485
OBJ: 17.1.2 Identify the main sources of genetic variation in a population.
STA: UT.BIO.5.2.b TOP: Foundation Edition
BLM: comprehension

63. ANS: genes

PTS: 1 DIF: L1 REF: p. 485
OBJ: 17.1.3 State what determines the number of phenotypes for a trait.
STA: UT.BIO.4.2.b TOP: Foundation Edition
BLM: knowledge

64. ANS: phenotypes

PTS: 1 DIF: L2 REF: p. 486
OBJ: 17.1.3 State what determines the number of phenotypes for a trait.
STA: UT.BIO.4.2.b TOP: Foundation Edition
BLM: comprehension

65. ANS: disruptive

PTS: 1 DIF: L3 REF: p. 489
OBJ: 17.2.1 Explain how natural selection affects single-gene and polygenic traits.
STA: UT.BIO.5.1.b BLM: evaluation

66. ANS:
fitness
appearance
phenotype

PTS: 1 DIF: L3 REF: p. 488
OBJ: 17.2.1 Explain how natural selection affects single-gene and polygenic traits.
STA: UT.BIO.5.1.b TOP: Foundation Edition
BLM: application

67. ANS: chance

PTS: 1 DIF: L2 REF: p. 490 OBJ: 17.2.2 Describe genetic drift.
STA: UT.BIO.5.1.c TOP: Foundation Edition
BLM: analysis

68. ANS: Hardy-Weinberg

PTS: 1 DIF: L1 REF: p. 491
OBJ: 17.2.3 Explain how different factors affect genetic equilibrium.
STA: UT.BIO.4.1.b TOP: Foundation Edition
BLM: knowledge

69. ANS: genetic equilibrium

PTS: 1 DIF: L2 REF: p. 491
OBJ: 17.2.3 Explain how different factors affect genetic equilibrium.
STA: UT.BIO.4.1.b TOP: Foundation Edition

BLM: comprehension

70. ANS: reproductively

PTS: 1 DIF: L1 REF: p. 494
OBJ: 17.3.1 Identify the types of isolation that can lead to the formation of new species.
STA: UT.BIO.5.1.c TOP: Foundation Edition
BLM: knowledge

71. ANS:
speciation
species formation

PTS: 1 DIF: L3 REF: p. 494
OBJ: 17.3.1 Identify the types of isolation that can lead to the formation of new species.
STA: UT.BIO.5.1.c TOP: Foundation Edition
BLM: synthesis

72. ANS: directional

PTS: 1 DIF: L2 REF: p. 496
OBJ: 17.3.2 Describe the current hypothesis about Galapagos finch speciation.
STA: UT.BIO.5.1.c | UT.BIO.5.2.d TOP: Foundation Edition
BLM: application

73. ANS: compete

PTS: 1 DIF: L2 REF: p. 497
OBJ: 17.3.2 Describe the current hypothesis about Galapagos finch speciation.
STA: UT.BIO.5.1.c | UT.BIO.5.2.d BLM: analysis

74. ANS: common ancestor

PTS: 1 DIF: L1 REF: p. 499
OBJ: 17.4.1 Explain how molecular clocks are used. STA: UT.BIO.4.3.d
TOP: Foundation Edition BLM: comprehension

75. ANS: molecular clock

PTS: 1 DIF: L1 REF: p. 498
OBJ: 17.4.1 Explain how molecular clocks are used. STA: UT.BIO.4.3.d
TOP: Foundation Edition BLM: comprehension

76. ANS: extinct

PTS: 1 DIF: L1 REF: p. 538
OBJ: 19.1.1 Explain what information fossils can reveal about ancient life.
STA: UT.BIO.5.2.a TOP: Foundation Edition
BLM: knowledge

77. ANS: fossil

PTS: 1 DIF: L1 REF: p. 539
OBJ: 19.1.1 Explain what information fossils can reveal about ancient life.
STA: UT.BIO.5.2.a TOP: Foundation Edition
BLM: knowledge

78. ANS: index

PTS: 1 DIF: L2 REF: p. 540
OBJ: 19.1.2 Differentiate between relative dating and radiometric dating.
STA: UT.BIO.5.2.a TOP: Foundation Edition
BLM: application

79. ANS: half-life

PTS: 1 DIF: L3 REF: p. 541
OBJ: 19.1.2 Differentiate between relative dating and radiometric dating.
STA: UT.BIO.5.2.a TOP: Foundation Edition
BLM: evaluation

80. ANS: periods

PTS: 1 DIF: L1 REF: p. 542
OBJ: 19.1.3 Identify the divisions of the geologic time scale. STA: UT.BIO.5.2.a
TOP: Foundation Edition BLM: knowledge

81. ANS:
plate tectonics
continental drift

PTS: 1 DIF: L2 REF: p. 551
OBJ: 19.1.4 Describe how environmental processes and living things have shaped life on Earth.
STA: UT.BIO.5.1.a TOP: Foundation Edition
BLM: comprehension

82. ANS: mass extinction

PTS: 1 DIF: L2 REF: p. 549
OBJ: 19.2.1 Identify the processes that influence survival or extinction of a species or clade.
STA: UT.BIO.5.1.a | UT.BIO.5.2.a TOP: Foundation Edition
BLM: comprehension

83. ANS: gradualism

PTS: 1 DIF: L3 REF: p. 549
OBJ: 19.2.2 Contrast gradualism and punctuated equilibrium. STA: UT.BIO.5.2.a
TOP: Foundation Edition BLM: evaluation

84. ANS: convergent evolution

PTS: 1 DIF: L3 REF: p. 550
OBJ: 19.2.3 Name two important patterns in macroevolution. STA: UT.BIO.5.1.b | UT.BIO.5.2.a
TOP: Foundation Edition BLM: evaluation

85. ANS: Coevolution

PTS: 1 DIF: L2 REF: p. 551
OBJ: 19.2.4 Explain the evolutionary characteristics of coevolving organisms.
STA: UT.BIO.5.2.a TOP: Foundation Edition
BLM: application

86. ANS: amino acids

PTS: 1 DIF: L1 REF: p. 554
OBJ: 19.3.1 Identify some of the hypotheses about early Earth and the origin of life.
STA: UT.BIO.2.1.a TOP: Foundation Edition

BLM: analysis

87. ANS: nitrogen

PTS: 1 DIF: L2 REF: p. 553
OBJ: 19.3.1 Identify some of the hypotheses about early Earth and the origin of life.
STA: UT.BIO.2.1.a TOP: Foundation Edition
BLM: analysis

88. ANS: Chloroplasts

PTS: 1 DIF: L1 REF: p. 556
OBJ: 19.3.2 Explain the endosymbiotic theory. STA: UT.BIO.1.3.a | UT.BIO.5.2.a
TOP: Foundation Edition BLM: comprehension

89. ANS: endosymbiotic

PTS: 1 DIF: L2 REF: p. 557
OBJ: 19.3.2 Explain the endosymbiotic theory. STA: UT.BIO.1.3.a | UT.BIO.5.2.a
TOP: Foundation Edition BLM: knowledge

90. ANS: asexually

PTS: 1 DIF: L3 REF: p. 558
OBJ: 19.3.3 Explain the significance of sexual reproduction in evolution.
STA: UT.BIO.4.1.b BLM: evaluation

SHORT ANSWER

91. ANS:
Darwin collected many examples of similar, but not identical, modern organisms as well as fossils that were previously unknown.These specimens helped him form his theory of evolution by natural selection.

PTS: 1 DIF: L3 REF: p. 452 | p. 453
OBJ: 16.1.1 State Charles Darwin's contribution to science. STA: UT.BIO.5.2.c
BLM: synthesis

92. ANS:
Darwin proposed a scientific theory of biological evolution to explain how organisms evolved over long periods of time through descent from common ancestors.

PTS: 1 DIF: L2 REF: p. 450
OBJ: 16.1.1 State Charles Darwin's contribution to science. STA: UT.BIO.5.2.c
TOP: Foundation Edition BLM: comprehension

93. ANS:
Darwin noticed that some of the fossils were similar to living species.

PTS: 1 DIF: L1 REF: p. 453
OBJ: 16.1.2 Describe the three patterns of biodiversity noted by Darwin.
STA: UT.BIO.5.2.c | UT.BIO.5.2.d TOP: Foundation Edition
BLM: comprehension

94. ANS:
The tortoises varied from island to island in predictable ways, such as shell shape and neck length. The variations seemed to enable the tortoises to exploit food resources on the islands.

PTS: 1 DIF: L2 REF: p. 452
OBJ: 16.1.2 Describe the three patterns of biodiversity noted by Darwin.
STA: UT.BIO.5.2.c | UT.BIO.5.2.d TOP: Foundation Edition
BLM: application

95. ANS:
Hutton and Lyell recognized that geologic process take place over much longer periods of time than was commonly thought. Further, these processes are the same that have been acting on Earth since its formation. Hutton and Lyell's ideas led them to conclude that Earth is millions, not thousands, of years old.

PTS: 1 DIF: L2 REF: p. 455
OBJ: 16.2.1 Identify the conclusions drawn by Hutton and Lyell about Earth's history.
STA: UT.BIO.5.2.c TOP: Foundation Edition
BLM: comprehension

96. ANS:
Lamarck thought that organisms tended toward complexity and perfection. He thought they could change their structures during their lifetimes through selective use and disuse. These acquired characteristics could then be inherited.

PTS: 1 DIF: L2 REF: p. 456
OBJ: 16.2.2 Describe Lamarck's hypothesis of evolution. STA: UT.BIO.5.2.c
TOP: Foundation Edition BLM: comprehension

97. ANS:
Malthus concluded that if human population growth was not "checked" by factors like disease, there would not be enough resources to sustain it.

PTS: 1 DIF: L2 REF: p. 457
OBJ: 16.2.3 Describe Malthus's view of population growth. STA: UT.BIO.5.2.c
TOP: Foundation Edition BLM: comprehension

98. ANS:
Farmers bred only animals with desirable traits, which resulted in improved offspring.

PTS: 1 DIF: L1 REF: p. 458
OBJ: 16.2.4 Explain the role of inherited variation in artificial selection.
STA: UT.BIO.5.1.a | UT.BIO.5.1.b TOP: Foundation Edition
BLM: knowledge

99. ANS:
In artificial selection, humans do the "selecting"—that is, they choose which traits they want to appear in future generations. In natural selection, the environment does the "selecting."

PTS: 1 DIF: L2 REF: p. 458
OBJ: 16.2.4 Explain the role of inherited variation in artificial selection.
STA: UT.BIO.5.1.a | UT.BIO.5.1.b TOP: Foundation Edition
BLM: analysis

100. ANS:
Natural selection occurs when 1) more individuals are born than can survive, 2) natural, heritable variations among organisms are present, and 3) organisms vary in their fitness.

PTS: 1 DIF: L2 REF: p. 463
OBJ: 16.3.1 Describe the conditions under which natural selection occurs.

STA: UT.BIO.5.1.a | UT.BIO.5.1.b | UT.BIO.5.2.d TOP: Foundation Edition
BLM: comprehension

101. ANS:
All living and extinct species are descended from a common ancestor.

PTS: 1 DIF: L2 REF: p. 464
OBJ: 16.3.2 Explain the principle of common descent. STA: UT.BIO.5.2.c
TOP: Foundation Edition BLM: comprehension

102. ANS:
Ancestors of modern whales probably had functional legs and lived on land.

PTS: 1 DIF: L2 REF: p. 467
OBJ: 16.4.2 Explain how fossils and the fossil record document the descent of modern species from ancient ancestors. STA: UT.BIO.5.2.a TOP: Foundation Edition
BLM: application

103. ANS:
It suggests that there is no disadvantage to fitness associated with the vestigial structures. If there were a disadvantage, then the structures would be selected against and you'd expect them to no longer be present.

PTS: 1 DIF: L2 REF: p. 469
OBJ: 16.4.3 Describe what homologous structures and embryology suggest about the process of evolutionary change. STA: UT.BIO.5.2.a
BLM: application

104. ANS:
The similarity of Hox genes in many types of organisms is evidence that the organisms all evolved from a common ancestor.

PTS: 1 DIF: L2 REF: p. 471
OBJ: 16.4.4 Explain how molecular evidence can be used to trace the process of evolution.
STA: UT.BIO.5.2.a BLM: analysis

105. ANS:
The Grants documented changes in the finch population consistent with Darwin's ideas of natural selection. Through their work, they discovered that natural selection can occur often and frequently.

PTS: 1 DIF: L2 REF: p. 472
OBJ: 16.4.5 Explain the results of the Grants' investigation of adaptation in Galapagos finches.
STA: UT.BIO.5.1.b | UT.BIO.5.2.c | UT.BIO.5.2.d TOP: Foundation Edition
BLM: comprehension

106. ANS:
Yes, the term *population* is defined in terms of a species. A population is a group of individuals of the same species that interbreed.

PTS: 1 DIF: L2 REF: p. 483
OBJ: 17.1.1 Define evolution in genetic terms. STA: UT.BIO.5.2.b
BLM: comprehension

107. ANS:
The allele frequency of an allele is the number of times the allele occurs in the gene pool divided by (or compared with) the total number of alleles for the same gene.

PTS: 1 DIF: L2 REF: p. 483

OBJ: 17.1.1 Define evolution in genetic terms. STA: UT.BIO.5.2.b
TOP: Foundation Edition BLM: application

108. ANS:
The three main sources of genetic variation are mutations, genetic recombination in sexual reproduction, and lateral gene transfer. Genetic recombination is most common in eukaryotes.

PTS: 1 DIF: L2 REF: p. 484 | p. 485
OBJ: 17.1.2 Identify the main sources of genetic variation in a population.
STA: UT.BIO.5.2.b TOP: Foundation Edition
BLM: comprehension

109. ANS:
A trait with two distinct phenotypes likely would be a single-gene trait. Because each gene of a polygenic trait often has two or more alleles, a polygenic trait can have many possible genotypes and phenotypes.

PTS: 1 DIF: L2 REF: p. 485 | p. 486
OBJ: 17.1.3 State what determines the number of phenotypes for a trait.
STA: UT.BIO.4.2.b TOP: Foundation Edition
BLM: application

110. ANS:
No. An allele for a trait that has no effect on fitness will not be affected by natural selection because it does not affect the survival and reproduction of individuals in a population.

PTS: 1 DIF: L3 REF: p. 488
OBJ: 17.2.1 Explain how natural selection affects single-gene and polygenic traits.
STA: UT.BIO.5.1.b BLM: synthesis

111. ANS:
Generally, the smaller a population is, the easier it is for allele frequencies to change. Genetic drift occurs when the allele frequencies in small populations change by chance.

PTS: 1 DIF: L3 REF: p. 490 OBJ: 17.2.2 Describe genetic drift.
STA: UT.BIO.5.1.c TOP: Foundation Edition
BLM: synthesis

112. ANS:
The five conditions are non-random mating, small population size, immigration or emigration, mutations, and natural selection.

PTS: 1 DIF: L2 REF: p. 492
OBJ: 17.2.3 Explain how different factors affect genetic equilibrium.
STA: UT.BIO.4.1.b TOP: Foundation Edition
BLM: knowledge

113. ANS:
A large river would likely keep populations of small rodents apart, but it would not necessarily isolate birds and other populations that can fly.

PTS: 1 DIF: L2 REF: p. 495
OBJ: 17.3.1 Identify the types of isolation that can lead to the formation of new species.
STA: UT.BIO.5.1.c TOP: Foundation Edition
BLM: application

114. ANS:

The three mechanisms for reproductive isolation are behavioral isolation, geographic isolation, and temporal isolation. Two populations of frogs that are isolated due to different mating calls is an example of behavioral isolation.

PTS: 1 DIF: L2 REF: p. 495
OBJ: 17.3.1 Identify the types of isolation that can lead to the formation of new species.
STA: UT.BIO.5.1.c TOP: Foundation Edition
BLM: application

115. ANS:
Speciation in the Galápagos finches occurred by the founding of a new population, the geographical isolation of a portion of that population, changes in the new population's gene pool, reproductive isolation, and ecological competition.

PTS: 1 DIF: L2 REF: p. 496 | p. 497
OBJ: 17.3.2 Describe the current hypothesis about Galapagos finch speciation.
STA: UT.BIO.5.1.c | UT.BIO.5.2.d TOP: Foundation Edition
BLM: application

116. ANS:
There are two differences in DNA between A and B, and three differences in DNA between A and C or B and C. You can infer that A and B share a more recent common ancestor than A and C or B and C.

PTS: 1 DIF: L3 REF: p. 499
OBJ: 17.4.1 Explain how molecular clocks are used. STA: UT.BIO.4.3.d
TOP: Foundation Edition BLM: synthesis

117. ANS:
Species C may share an older common ancestor with both Species A and B. The longer a species has been evolving independently, the more differences there are likely to be in the gene pool of those species.

PTS: 1 DIF: L3 REF: p. 499
OBJ: 17.4.1 Explain how molecular clocks are used. STA: UT.BIO.4.3.d
TOP: Foundation Edition BLM: synthesis

118. ANS:
Gene duplication can affect evolution because the duplicate might acquire a mutation. If that mutation is positive, it will be will be selected for by natural selection to become more frequent in the population.

PTS: 1 DIF: L2 REF: p. 500
OBJ: 17.4.2 Explain how new genes evolve. STA: UT.BIO.4.3.d
TOP: Foundation Edition BLM: analysis

119. ANS:
Hox genes can turn other genes on or off during embryological development. A change in the activity of one Hox gene can affect how an entire segment of an organism is patterned. For example, whether the segment has legs or wings, and how big or small those legs or wings will be.

PTS: 1 DIF: L2 REF: p. 501
OBJ: 17.4.3 Describe how Hox genes may be involved in evolutionary change.
STA: UT.BIO.5.2.a TOP: Foundation Edition
BLM: synthesis

120. ANS:
A small change in what a Hox gene does can cause a large change in an organism. If a Hox gene turns off a gene for wings in an insect larva, the adult insect will probably not have wings.

PTS: 1 DIF: L2 REF: p. 501
OBJ: 17.4.3 Describe how Hox genes may be involved in evolutionary change.
STA: UT.BIO.5.2.a TOP: Foundation Edition
BLM: application

121. ANS:
The formation of a fossil depends on a precise combination of conditions; therefore, many ancient organisms died without leaving a trace.

PTS: 1 DIF: L2 REF: p. 538
OBJ: 19.1.1 Explain what information fossils can reveal about ancient life.
STA: UT.BIO.5.2.a TOP: Foundation Edition
BLM: analysis

122. ANS:
Answers may include two of the following: the organisms' structures, what they ate, what ate them, the environment in which they lived, how long ago they lived, the order in which they lived, what other organisms were similar to them, and how they changed over time.

PTS: 1 DIF: L2 REF: p. 539
OBJ: 19.1.1 Explain what information fossils can reveal about ancient life.
STA: UT.BIO.5.2.a TOP: Foundation Edition
BLM: application

123. ANS:
Relative dating allows paleontologists to estimate a rock layer or fossil's age compared with that of other rock layers or fossils.

PTS: 1 DIF: L2 REF: p. 538
OBJ: 19.1.2 Differentiate between relative dating and radiometric dating.
STA: UT.BIO.5.2.a TOP: Foundation Edition
BLM: application

124. ANS:
Fossil A is older than fossil B. A fossil with a smaller proportion of carbon-14 than another fossil has been in existence longer.

PTS: 1 DIF: L3 REF: p. 541
OBJ: 19.1.2 Differentiate between relative dating and radiometric dating.
STA: UT.BIO.5.2.a BLM: synthesis

125. ANS:
The divisions of geologic time are based on evidence from rock layers that reveal major changes in fossil animals and plants. These divisions vary in length.

PTS: 1 DIF: L2 REF: p. 542
OBJ: 19.1.3 Identify the divisions of the geologic time scale. STA: UT.BIO.5.2.a
BLM: analysis

126. ANS:
The clade will probably continue to survive, because it has many other clades that continue to survive and evolve new species (examples include turtles, snakes, crocodiles, and birds). This means that Reptilia's rate of speciation has been equal to or greater than its rate of extinction. As long as this remains true, Reptilia will not become extinct.

PTS: 1 DIF: L2 REF: p. 547
OBJ: 19.2.1 Identify the processes that influence survival or extinction of a species or clade.
STA: UT.BIO.5.1.a | UT.BIO.5.2.a TOP: Foundation Edition
BLM: evaluation

127. ANS:
Background extinction is the extinction of a single species as the result of the normal process of natural selection. It takes place over a long period of time. Mass extinction is the rapid extinction of many species over a short period of time as the result of a catastrophic environmental event.

PTS: 1 DIF: L2 REF: p. 548
OBJ: 19.2.1 Identify the processes that influence survival or extinction of a species or clade.
STA: UT.BIO.5.1.a | UT.BIO.5.2.a TOP: Foundation Edition
BLM: comprehension

128. ANS:
The Galápagos finches evolved very rapidly from single mainland species. Each finch species occupies a distinct niche meaning they each live in slightly different ways.

PTS: 1 DIF: L3 REF: p. 549
OBJ: 19.2.2 Contrast gradualism and punctuated equilibrium. STA: UT.BIO.5.2.a
BLM: synthesis

129. ANS:
speciation and extinction

PTS: 1 DIF: L1 REF: p. 546
OBJ: 19.2.3 Name two important patterns in macroevolution. STA: UT.BIO.5.1.b | UT.BIO.5.2.a
TOP: Foundation Edition BLM: knowledge

130. ANS:
The plant would evolve by producing greater numbers of flowers in a color or colors that the pollinator can easily see.

PTS: 1 DIF: L2 REF: p. 552
OBJ: 19.2.4 Explain the evolutionary characteristics of coevolving organisms.
STA: UT.BIO.5.2.a BLM: synthesis

131. ANS:
Oceans did not exist because the surface of Earth was too hot for the presence of liquid water.

PTS: 1 DIF: L1 REF: p. 553
OBJ: 19.3.1 Identify some of the hypotheses about early Earth and the origin of life.
STA: UT.BIO.2.1.a BLM: knowledge

132. ANS:
Microorganisms are composed of the very molecules Miller and Urey were trying to produce, so their presence or their waste products might have falsely indicated that organic molecules were produced from the simpler molecules.

PTS: 1 DIF: L3 REF: p. 554
OBJ: 19.3.1 Identify some of the hypotheses about early Earth and the origin of life.
STA: UT.BIO.2.1.a BLM: evaluation

133. ANS:
Scientists could see that the membranes of mitochondria and chloroplasts resembled the plasma membranes of free-living prokaryotes.

PTS: 1 DIF: L3 REF: p. 556
OBJ: 19.3.2 Explain the endosymbiotic theory. STA: UT.BIO.1.3.a | UT.BIO.5.2.a
BLM: synthesis

134. ANS:
As photosynthetic organisms increased in number, the massive amounts of oxygen these organisms generated caused the dissolved iron in ocean water to settle out. They also pulled large quantities of carbon dioxide out of the atmosphere and replaced it with oxygen. This reduction in carbon dioxide caused Earth to cool.

PTS: 1 DIF: L2 REF: p. 544
OBJ: 19.1.4 Describe how environmental processes and living things have shaped life on Earth.
STA: UT.BIO.5.1.a TOP: Foundation Edition
BLM: synthesis

135. ANS:
This is asexual reproduction because there is a single parent. Using cuttings from a single plant would reduce the genetic diversity of the population.

PTS: 1 DIF: L2 REF: p. 558
OBJ: 19.3.3 Explain the significance of sexual reproduction in evolution.
STA: UT.BIO.4.1.b BLM: evaluation

OTHER

136. ANS:
The tortoises have necks of different lengths and shells that differ in overall shape and in the size of the opening for the neck.

PTS: 1 DIF: L2 REF: p. 452
OBJ: 16.1.2 Describe the three patterns of biodiversity noted by Darwin.
STA: UT.BIO.5.2.c | UT.BIO.5.2.d TOP: Foundation Edition
BLM: analysis

137. ANS:
The Hood Island tortoise has the longest neck.

PTS: 1 DIF: L2 REF: p. 452
OBJ: 16.1.2 Describe the three patterns of biodiversity noted by Darwin.
STA: UT.BIO.5.2.c | UT.BIO.5.2.d TOP: Foundation Edition
BLM: application

138. ANS:
Ancestral tortoises with long necks and shells that permitted greater neck movement obtained food more easily, survived longer, and produced more offspring than other tortoises.

PTS: 1 DIF: L3 REF: p. 452
OBJ: 16.3.1 Describe the conditions under which natural selection occurs.
STA: UT.BIO.5.1.a | UT.BIO.5.1.b | UT.BIO.5.2.d BLM: synthesis

139. ANS:
The Pinta Island tortoises would be likely to survive more successfully because they appear to be more similar to the Hood Island tortoises.

PTS: 1 DIF: L3 REF: p. 452

OBJ: 16.3.1 Describe the conditions under which natural selection occurs.
STA: UT.BIO.5.1.a | UT.BIO.5.1.b | UT.BIO.5.2.d TOP: Foundation Edition
BLM: evaluation

140. ANS:
No. The diagram does not provide information on the ancestral species.

PTS: 1 DIF: L2 REF: p. 452
OBJ: 16.4.2 Explain how fossils and the fossil record document the descent of modern species from ancient ancestors. STA: UT.BIO.5.2.a BLM: analysis

141. ANS:
Darwin proposed that over time, natural selection made a population more fit for its environment. Sharks and dolphins both live in the ocean, where natural selection favors organisms that move efficiently through water.

PTS: 1 DIF: L3 REF: p. 452 | p. 453
OBJ: 16.1.2 Describe the three patterns of biodiversity noted by Darwin.
STA: UT.BIO.5.2.c | UT.BIO.5.2.d TOP: Foundation Edition
BLM: synthesis

142. ANS:
Sharks show fitness because they are able to survive and reproduce successfully in their ocean environment. Students should give two of the following examples: (1) Sharks have an overall body shape that enables them to move rapidly through water. (2) Sharks have a large tail and fins that provide balance and enable them to steer. (3) Sharks have teeth that make them successful predators.

PTS: 1 DIF: L3 REF: p. 461
OBJ: 16.3.1 Describe the conditions under which natural selection occurs.
STA: UT.BIO.5.1.a | UT.BIO.5.1.b | UT.BIO.5.2.d TOP: Foundation Edition
BLM: synthesis

143. ANS:
Student answer may include that the dolphin's land-dwelling ancestors were probably made up of populations with different body shapes and limbs. Those land-dwellers began to spend more time in the ocean, perhaps because food was easier to find. In each generation, those with bodies that moved efficiently in water survived longer and produced more offspring than others. Eventually, the whole population came to resemble today's dolphins.

PTS: 1 DIF: L3 REF: p. 463
OBJ: 16.3.1 Describe the conditions under which natural selection occurs.
STA: UT.BIO.5.1.a | UT.BIO.5.1.b | UT.BIO.5.2.d TOP: Foundation Edition
BLM: synthesis

144. ANS:
It is not likely. Possible arguments: (1) Darwin emphasized that evolution usually requires millions, not thousands, of years. (2) The bodies of dolphins are well adapted to life in water, with little observable variation; it's unlikely that the population's relevant characteristics could change in just thousands of years.

PTS: 1 DIF: L3 REF: p. 450 | p. 460
OBJ: 16.3.1 Describe the conditions under which natural selection occurs.
STA: UT.BIO.5.1.a | UT.BIO.5.1.b | UT.BIO.5.2.d BLM: synthesis

145. ANS:
Student answer could include that although their skeletons are made of different materials, there are likely to be homologous structures in the skull, backbone, and limbs. There may also be homologous structures among internal organs such as heart, brain, and digestive system.

PTS: 1 DIF: L3 REF: p. 468
OBJ: 16.4.3 Describe what homologous structures and embryology suggest about the process of evolutionary change. STA: UT.BIO.5.2.a
TOP: Foundation Edition BLM: synthesis

146. ANS:
Scientists probably used the fossil bones of ancient horses from several sites and compared them with the bodies of modern horses.

PTS: 1 DIF: L3 REF: p. 468
OBJ: 16.4.1 Explain how geologic distribution of species relates to their evolutionary history.
STA: UT.BIO.5.1.a | UT.BIO.5.1.c TOP: Foundation Edition
BLM: synthesis

147. ANS:
Body size increased in mass and volume. (The horse became taller and heavier.)

PTS: 1 DIF: L2 REF: p. 466 | p. 467
OBJ: 16.4.2 Explain how fossils and the fossil record document the descent of modern species from ancient ancestors. STA: UT.BIO.5.2.a TOP: Foundation Edition
BLM: analysis

148. ANS:
The head becomes larger.

PTS: 1 DIF: L2 REF: p. 466 | p. 467
OBJ: 16.4.2 Explain how fossils and the fossil record document the descent of modern species from ancient ancestors. STA: UT.BIO.5.2.a TOP: Foundation Edition
BLM: analysis

149. ANS:
The number of toes decreased from three to one.

PTS: 1 DIF: L2 REF: p. 468
OBJ: 16.4.2 Explain how fossils and the fossil record document the descent of modern species from ancient ancestors. STA: UT.BIO.5.2.a TOP: Foundation Edition
BLM: analysis

150. ANS:
No, this diagram shows a pattern only in horse evolution. Many other species have remained small.

PTS: 1 DIF: L3 REF: p. 468
OBJ: 16.4.2 Explain how fossils and the fossil record document the descent of modern species from ancient ancestors. STA: UT.BIO.5.2.a TOP: Foundation Edition
BLM: evaluation

151. ANS:
The average beak size of the birds represented in Graph A has increased through directional selection. There are now no birds with the smallest beaks, and some birds with very large beaks have evolved.

PTS: 1 DIF: L2 REF: p. 489
OBJ: 17.2.1 Explain how natural selection affects single-gene and polygenic traits.
STA: UT.BIO.5.1.b TOP: Foundation Edition
BLM: application

152. ANS:

Stabilizing selection has occurred. There are more birds with a body mass of average size and no birds with extremely large or small body mass.

PTS: 1 DIF: L2 REF: p. 489
OBJ: 17.2.1 Explain how natural selection affects single-gene and polygenic traits.
STA: UT.BIO.5.1.b TOP: Foundation Edition
BLM: application

153. ANS:
Disruptive selection has occurred. There are more birds with smaller or larger beak sizes and few or no birds having the average beak size.

PTS: 1 DIF: L2 REF: p. 489
OBJ: 17.2.1 Explain how natural selection affects single-gene and polygenic traits.
STA: UT.BIO.5.1.b TOP: Foundation Edition
BLM: application

154. ANS:
Graph C in Figure 17–5 shows a population with two very different beak sizes, which indicates that the birds could be eating different foods.

PTS: 1 DIF: L2 REF: p. 489
OBJ: 17.2.1 Explain how natural selection affects single-gene and polygenic traits.
STA: UT.BIO.5.1.b TOP: Foundation Edition
BLM: analysis

155. ANS:
Student answers might include that a change in the birds' environment, such as the introduction of a larger kind of food, could have caused the directional selection in favor of larger beaks.

PTS: 1 DIF: L3 REF: p. 489
OBJ: 17.2.1 Explain how natural selection affects single-gene and polygenic traits.
STA: UT.BIO.5.1.b TOP: Foundation Edition
BLM: synthesis

156. ANS:
Figure 17–6 shows the times of mating activity for seven species of frogs. Four of the species mate in the spring. The other three species mate in the summer.

PTS: 1 DIF: L2 REF: p. 495
OBJ: 17.3.1 Identify the types of isolation that can lead to the formation of new species.
STA: UT.BIO.5.1.c TOP: Foundation Edition
BLM: application

157. ANS:
Frog mating nearly stops in early to mid-May.

PTS: 1 DIF: L2 REF: p. 495
OBJ: 17.3.1 Identify the types of isolation that can lead to the formation of new species.
STA: UT.BIO.5.1.c TOP: Foundation Edition
BLM: application

158. ANS:
The graph shows that bullfrogs typically mate after the other frog species shown, an example of temporal isolation. Bullfrogs might also use different courtship rituals, such as different mating calls, which would be an example of behavioral isolation.

PTS: 1 DIF: L2 REF: p. 495
OBJ: 17.3.1 Identify the types of isolation that can lead to the formation of new species.
STA: UT.BIO.5.1.c TOP: Foundation Edition
BLM: application

159. ANS:
The two species must be behaviorally isolated because they are not isolated either temporally or geographically.

PTS: 1 DIF: L2 REF: p. 495
OBJ: 17.3.1 Identify the types of isolation that can lead to the formation of new species.
STA: UT.BIO.5.1.c TOP: Foundation Edition
BLM: analysis

160. ANS:
Since temperatures in the south are typically warmer than in the north, frog mating seasons might also occur earlier. In that case, the curves likely would shift to the left.

PTS: 1 DIF: L3 REF: p. 495
OBJ: 17.3.1 Identify the types of isolation that can lead to the formation of new species.
STA: UT.BIO.5.1.c BLM: synthesis

161. ANS:
Speciation is the formation of new species. Figure 17–7 shows how an ancestral bird population gave rise to a variety of new bird species over time. For example, the diagram shows that the original population separated into two populations, tree finches and ground finches. Then each of those evolved into new species over time.

PTS: 1 DIF: L2 REF: p. 494 | p. 495
OBJ: 17.3.2 Describe the current hypothesis about Galapagos finch speciation.
STA: UT.BIO.5.1.c | UT.BIO.5.2.d TOP: Foundation Edition
BLM: application

162. ANS:
Since a species is defined as being reproductively isolated from other closely related groups, researchers could determine whether members of the two groups will mate and produce fertile offspring in the wild. That might be done by observing members of the two groups. If members of the two groups interbreed and produce fertile offspring, they would be considered a single species.

PTS: 1 DIF: L2 REF: p. 494
OBJ: 17.3.2 Describe the current hypothesis about Galapagos finch speciation.
STA: UT.BIO.5.1.c | UT.BIO.5.2.d TOP: Foundation Edition
BLM: application

163. ANS:
In the case of nearby islands, geographic isolation is the main mechanism for bringing about the reproductive isolation involved in speciation. As each new species was forming, however, particular changes in the groups may have also brought about behavioral and temporal isolation.

PTS: 1 DIF: L3 REF: p. 496 | p. 497
OBJ: 17.3.2 Describe the current hypothesis about Galapagos finch speciation.
STA: UT.BIO.5.1.c | UT.BIO.5.2.d TOP: Foundation Edition
BLM: synthesis

164. ANS:

Given that the two species were formed from a single ancestral species, and the bird beaks are of such different sizes, it's most likely that disruptive selection occurred. If directional or stabilizing selection had occurred, the original species would have evolved as a single population.

PTS: 1 DIF: L3 REF: p. 496 | p. 497
OBJ: 17.3.2 Describe the current hypothesis about Galapagos finch speciation.
STA: UT.BIO.5.1.c | UT.BIO.5.2.d TOP: Foundation Edition
BLM: evaluation

165. ANS:
The diagram shows that the large tree finch is a species of insect-eating tree finches with a particularly large beak. It is likely that natural selection favored tree finches able to feed on large insects, eventually resulting in the formation of a separate species with this adaptation.

PTS: 1 DIF: L3 REF: p. 496 | p. 497
OBJ: 17.3.2 Describe the current hypothesis about Galapagos finch speciation.
STA: UT.BIO.5.1.c | UT.BIO.5.2.d TOP: Foundation Edition
BLM: synthesis

166. ANS:
12 periods are shown in Figure 19–4. The Cambrian Period is the earliest one.

PTS: 1 DIF: L1 REF: p. 542
OBJ: 19.1.3 Identify the divisions of the geologic time scale. STA: UT.BIO.5.2.a
TOP: Foundation Edition BLM: application

167. ANS:
The disappearance of many species is called a mass extinction. The mass extinction at the end of the Paleozoic Era occurred at the end of the Permian Period.

PTS: 1 DIF: L2 REF: p. 542 | p. 543
OBJ: 19.1.3 Identify the divisions of the geologic time scale. STA: UT.BIO.5.2.a
TOP: Foundation Edition BLM: application

168. ANS:
65.5 million years ago

PTS: 1 DIF: L2 REF: p. 542
OBJ: 19.1.3 Identify the divisions of the geologic time scale. STA: UT.BIO.5.2.a
TOP: Foundation Edition BLM: analysis

169. ANS:
The Silurian Period lasted for 29 million years.

PTS: 1 DIF: L2 REF: p. 542
OBJ: 19.1.3 Identify the divisions of the geologic time scale. STA: UT.BIO.5.2.a
TOP: Foundation Edition BLM: application

170. ANS:
Marsupials evolved during the Cretaceous Period.

PTS: 1 DIF: L2 REF: p. 543
OBJ: 19.1.3 Identify the divisions of the geologic time scale. STA: UT.BIO.5.2.a
TOP: Foundation Edition BLM: analysis

171. ANS:
The half-life of carbon-14 is 5730 years. Accept answers within a reasonable range.

PTS: 1 DIF: L1 REF: p. 541
OBJ: 19.1.2 Differentiate between relative dating and radiometric dating.
STA: UT.BIO.5.2.a TOP: Foundation Edition
BLM: analysis

172. ANS:
The bone is about 23,000 years old.

PTS: 1 DIF: L2 REF: p. 541
OBJ: 19.1.2 Differentiate between relative dating and radiometric dating.
STA: UT.BIO.5.2.a BLM: analysis

173. ANS:
Carbon-14 dating would be more useful for dating the wooden beams. 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: L2 REF: p. 541
OBJ: 19.1.2 Differentiate between relative dating and radiometric dating.
STA: UT.BIO.5.2.a TOP: Foundation Edition
BLM: evaluation

174. ANS:
Three half-lives have passed.

PTS: 1 DIF: L3 REF: p. 541
OBJ: 19.1.2 Differentiate between relative dating and radiometric dating.
STA: UT.BIO.5.2.a BLM: analysis

175. ANS:
The amount of nitrogen gas produced by radioactive decay would decline throughout the period of decay, with the largest amount being produced at the beginning. This is when the greatest proportion of carbon-14 decays, with progressively smaller fractions decaying (and correspondingly smaller amounts of nitrogen gas being produced) over time.

PTS: 1 DIF: L3 REF: p. 541
OBJ: 19.1.2 Differentiate between relative dating and radiometric dating.
STA: UT.BIO.5.2.a BLM: evaluation

176. ANS:
The Sirenians are the most closely related of the groups in this evolutionary tree.

PTS: 1 DIF: L1 REF: p. 547
OBJ: 19.2.3 Name two important patterns in macroevolution. STA: UT.BIO.5.1.b | UT.BIO.5.2.a
BLM: analysis

177. ANS:
The Artiodactyls have existed the longest, because their branch in the evolutionary tree is the longest branch.

PTS: 1 DIF: L2 REF: p. 544
OBJ: 19.2.1 Identify the processes that influence survival or extinction of a species or clade.
STA: UT.BIO.5.1.a | UT.BIO.5.2.a BLM: evaluation

178. ANS:
The different groups are most likely the result of adaptive radiation, because they share a recent common ancestor.

PTS: 1 DIF: L2 REF: p. 550
OBJ: 19.2.3 Name two important patterns in macroevolution. STA: UT.BIO.5.1.b | UT.BIO.5.2.a
TOP: Foundation Edition BLM: application

179. ANS:
The evolutionary tree most likely will look different thousands of years from now, because the modern mammals in each of these groups are still evolving. New groups may evolve through adaptive radiation, causing the appearance of new branches in the tree. One or more groups may become extinct due to natural selection or a catastrophic event that causes a mass extinction. This would cause some branches to stop growing over time.

PTS: 1 DIF: L3 REF: p. 547
OBJ: 19.2.1 Identify the processes that influence survival or extinction of a species or clade.
STA: UT.BIO.5.1.a | UT.BIO.5.2.a BLM: evaluation

180. ANS:
Some of the differences between the groups might be due to land-forming events or continental drift, but environmental changes were probably the most responsible for the great diversity shown in the evolutionary tree. The groups represented live in very different environments. For example, artiodactyls live in desert biomes, while perissodactyls and proboscideans are found mostly in grassland and some forest biomes. Cetaceans and sirenians are marine aquatic species. As environmental changes occurred, adaptations led to new branches of the evolutionary tree forming.

PTS: 1 DIF: L3 REF: p. 544
OBJ: 19.1.4 Describe how environmental processes and living things have shaped life on Earth.
STA: UT.BIO.5.1.a TOP: Foundation Edition
BLM: evaluation

ESSAY

181. ANS:
Darwin made a wealth of observations about the natural world and developed a hypothesis that became the theory of evolution. He explained that species change over time through natural selection: the survival and reproduction of those members of a population that best suit their environment.

PTS: 1 DIF: L2 REF: p. 450 | p. 460
OBJ: 16.1.1 State Charles Darwin's contribution to science. STA: UT.BIO.5.2.c
TOP: Foundation Edition BLM: comprehension

182. ANS:
Darwin considered the fossil record, the geographic distribution of living species, the evidence of homologous body structures, and similarities in embryological development of vertebrates.

PTS: 1 DIF: L2 REF: p. 465 | p. 466 | p. 467 | p. 468 | p. 469
OBJ: 16.1.1 State Charles Darwin's contribution to science. STA: UT.BIO.5.2.c
TOP: Foundation Edition BLM: application

183. ANS:
On the *Beagle*, Darwin saw three species of large, flightless birds living in similar habitats on different continents. Rheas lived only in South America, ostriches only in Africa, and emus only in Australia.

PTS: 1 DIF: L2 REF: p. 451
OBJ: 16.1.2 Describe the three patterns of biodiversity noted by Darwin.
STA: UT.BIO.5.2.c | UT.BIO.5.2.d TOP: Foundation Edition

BLM: comprehension

184. ANS:
Lamarck was among the first to recognize that living things changed over time and that organisms were adapted to their environments. Lamarck’s explanation for the process of evolution, however, was incorrect.

PTS: 1 DIF: L2 REF: p. 456
OBJ: 16.2.2 Describe Lamarck's hypothesis of evolution. STA: UT.BIO.5.2.c
TOP: Foundation Edition BLM: application

185. ANS:
Malthus thought that humans would run out of living space and food because the number of births exceeded the number of deaths. Darwin applied this idea to all species, realizing that populations produce huge numbers of offspring, yet only a small percentage survives. Darwin then sought to determine which factors affect an organism and what effect those events would have over time.

PTS: 1 DIF: L2 REF: p. 457
OBJ: 16.2.3 Describe Malthus's view of population growth. STA: UT.BIO.5.2.c
TOP: Foundation Edition BLM: comprehension

186. ANS:
Darwin began to think that the varied finch and tortoise species on the islands had evolved from a single finch and single tortoise species from the mainland. This contributed to the development of the idea of natural selection.

PTS: 1 DIF: L2 REF: p. 450 | p. 452
OBJ: 16.3.1 Describe the conditions under which natural selection occurs.
STA: UT.BIO.5.1.a | UT.BIO.5.1.b | UT.BIO.5.2.d TOP: Foundation Edition
BLM: analysis

187. ANS:
Farmers cultivate plants and animals by selecting individuals for their desirable traits and crossing them. Darwin realized that factors in the environment could act in a comparable way, “selecting” the organisms that would die early and those that would survive and pass their traits to the next generation.

PTS: 1 DIF: L2 REF: p. 457 | p. 458
OBJ: 16.3.1 Describe the conditions under which natural selection occurs.
STA: UT.BIO.5.1.a | UT.BIO.5.1.b | UT.BIO.5.2.d TOP: Foundation Edition
BLM: analysis

188. ANS:
The population’s survival would depend on how well adapted its members were to the new environment. If they were not well adapted, the population would probably not survive because it had so little variation.

PTS: 1 DIF: L2 REF: p. 460 | p. 463
OBJ: 16.3.1 Describe the conditions under which natural selection occurs.
STA: UT.BIO.5.1.a | UT.BIO.5.1.b | UT.BIO.5.2.d TOP: Foundation Edition
BLM: application

189. ANS:
If the population had a variety of traits, some of its members might be able to survive and reproduce in the new environment. If not, the population would probably become extinct.

PTS: 1 DIF: L3 REF: p. 463
OBJ: 16.3.1 Describe the conditions under which natural selection occurs.
STA: UT.BIO.5.1.a | UT.BIO.5.1.b | UT.BIO.5.2.d TOP: Foundation Edition

BLM: synthesis

190. ANS:

In their mature forms, homologous structures, such as bird wings and mammal forelimbs, appear somewhat different, but they develop from the same kinds of embryonic tissues. From this evidence, scientists infer that the particular species evolved from a common ancestor population that moved into different environments, where the populations were changed through natural selection.

PTS: 1 DIF: L3 REF: p. 468
OBJ: 16.4.3 Describe what homologous structures and embryology suggest about the process of evolutionary change. STA: UT.BIO.5.2.a
TOP: Foundation Edition BLM: synthesis

191. ANS:

An individual would be more likely to have an allele with a high allele frequency. A high frequency indicates that the allele occurs at a higher percentage, or more often, than do alleles with a low allele frequency.

PTS: 1 DIF: L3 REF: p. 483
OBJ: 17.1.1 Define evolution in genetic terms. STA: UT.BIO.5.2.b
TOP: Foundation Edition BLM: synthesis

192. ANS:

A mutation is any change in the genetic material of a cell. Some mutations reduce an organism’s ability to survive, such as an insect with a tongue that is too short to eat its usual amount of food. A mutation that is neutral has no effect on the organism’s phenotype and therefore no effect on fitness.

PTS: 1 DIF: L3 REF: p. 484
OBJ: 17.1.2 Identify the main sources of genetic variation in a population.
STA: UT.BIO.5.2.b TOP: Foundation Edition
BLM: synthesis

193. ANS:

The frequencies of phenotypes for a single-gene trait are best expressed as a bar graph because variations in the gene lead to only a few distinct phenotypes. The frequencies of phenotypes for a polygenic trait, however, are usually best expressed as a bell-shaped curve because one polygenic trait can have many possible phenotypes.

PTS: 1 DIF: L3 REF: p. 485 | p. 486
OBJ: 17.1.3 State what determines the number of phenotypes for a trait.
STA: UT.BIO.4.2.b BLM: synthesis

194. ANS:

The founder effect is a situation in which frequencies of alleles change as a result of the migration of a small subgroup of a population. This subgroup may carry alleles in different frequencies than does the larger population from which it came. The founder effect arises from genetic drift—a change in the frequencies of alleles due to chance rather than to natural selection.

PTS: 1 DIF: L2 REF: p. 490 OBJ: 17.2.2 Describe genetic drift.
STA: UT.BIO.5.1.c TOP: Foundation Edition
BLM: application

195. ANS:

In a gene pool of a population, the allele frequencies will change (1) when non-random mating occurs, since sexual selection can change gene frequency, (2) when there is immigration or emigration to add or remove genes, and (3) when natural selection favors a particular phenotype.

PTS: 1 DIF: L3 REF: p. 492
OBJ: 17.2.3 Explain how different factors affect genetic equilibrium.
STA: UT.BIO.4.1.b TOP: Foundation Edition
BLM: synthesis

196. ANS:
The two populations would become different species. Speciation would tend to occur more quickly in two groups in different ecosystems than in similar ecosystems because in different ecosystems, the groups would experience different selection pressures. Those selection pressures would drive the evolution of the two populations in different directions, speeding up the process of speciation.

PTS: 1 DIF: L3 REF: p. 495
OBJ: 17.3.1 Identify the types of isolation that can lead to the formation of new species.
STA: UT.BIO.5.1.c TOP: Foundation Edition
BLM: evaluation

197. ANS:
The directional selection likely would not have been as pronounced as it was because it was driven by availability of vegetation of different types. Evolution probably would not have progressed as quickly as it did because selection pressures would have been lower under those circumstances.

PTS: 1 DIF: L3 REF: p. 496 | p. 497
OBJ: 17.3.2 Describe the current hypothesis about Galapagos finch speciation.
STA: UT.BIO.5.1.c | UT.BIO.5.2.d TOP: Foundation Edition
BLM: evaluation

198. ANS:
Student's answer may include that a neutral mutation would not affect an organism's phenotype. A neutral mutation would likely occur at about the same rate in different species, letting researchers compare the DNA using a molecular clock. Students may point out that mutations that have a large positive or negative effect on an organism's phenotype are very much affected by natural selection and too variable for molecular clocks.

PTS: 1 DIF: L2 REF: p. 498
OBJ: 17.4.1 Explain how molecular clocks are used. STA: UT.BIO.4.3.d
TOP: Foundation Edition BLM: comprehension

199. ANS:
Student's answer could include reasoning that during meiosis, a chromosome may acquire a duplicate gene. If a mutation occurs in the duplicate gene, that mutation might cause a change in the function of the duplicate gene. If the gene affects the phenotype of the organism, natural selection could act on the population.

PTS: 1 DIF: L2 REF: p. 499
OBJ: 17.4.2 Explain how new genes evolve. STA: UT.BIO.4.3.d
TOP: Foundation Edition BLM: analysis

200. ANS:
A mutation in the Hox genes that control the development of neck length could cause longer or shorter necks. An organism with a longer neck might be able to get food more efficiently. Therefore, the organism might survive better to become a new species.

PTS: 1 DIF: L2 REF: p. 501
OBJ: 17.4.3 Describe how Hox genes may be involved in evolutionary change.
STA: UT.BIO.5.2.a TOP: Foundation Edition
BLM: analysis

201. ANS:

Sample answer: The fish died and was buried in sediment at the bottom of a body of water. Over time, the weight of upper layers of sediment compressed the lower layers, containing the fish, into new rocks. Minerals replaced parts of the fish's body, producing a fossil. The once-deep sedimentary layer containing the fossil was uplifted by geological forces and then eroded, exposing the fossil.

PTS: 1 DIF: L3 REF: p. 539
OBJ: 19.1.1 Explain what information fossils can reveal about ancient life.
STA: UT.BIO.5.2.a BLM: synthesis

202. ANS:
Radioactive dating involves using a radioactive isotope in a sample to determine its age. A radioactive element decays at a steady rate. 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: L2 REF: p. 540
OBJ: 19.1.2 Differentiate between relative dating and radiometric dating.
STA: UT.BIO.5.2.a TOP: Foundation Edition
BLM: analysis

203. 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. The time scale is based on both relative and absolute dating. Divisions of the time scale are marked by changes in the fossil record. For example, the end of the Mesozoic Era is marked by the mass extinction of many species, including dinosaurs.

PTS: 1 DIF: L3 REF: p. 542
OBJ: 19.1.3 Identify the divisions of the geologic time scale. STA: UT.BIO.5.2.a
TOP: Foundation Edition BLM: synthesis

204. ANS:
Physical processes such as climate, plate tectonics, volcanic eruptions, ocean currents and mountain-building all affect how life on Earth has evolved. Changes in global temperature led to heat waves and ice ages that affected species survival. Continental drift led to speciation and in some cases extinction as organisms were shifted away from their original environments. volcanic eruptions and other mountain-building activities changed environments and led to adaptation, speciation, and extinction as well. Continental drift also altered ocean currents, affecting aquatic environments and their inhabitants. Biological processes such as photosynthesis led to a change in atmospheric composition. This led to evolution among early life forms from using carbon dioxide and other gases for energy metabolism to using oxygen. The massive production of oxygen also affected the ocean waters by reacting with iron and precipitating it out, leaving the clear blue oceans we have today.

PTS: 1 DIF: L2 REF: p. 544
OBJ: 19.1.4 Describe how environmental processes and living things have shaped life on Earth.
STA: UT.BIO.5.1.a TOP: Foundation Edition
BLM: synthesis

205. ANS:

The survival of a clade is determined by its rates of speciation and extinction. Speciation that results in a wide genetic diversity among the different species of the clade enhances the clade's ability to survive major changes in the environment rather than become extinct. As long as the rate of speciation is at least equal to the rate of extinction, the clade will survive, even if some of the smaller clades within that clade become extinct. However, if the rate of speciation is less than the rate of extinction, then the clade will suffer extinctions faster than species can evolve to keep the clade going. This leads to the extinction of the clade. For example, all of the dinosaur species except those that evolved into modern bird are extinct in the clade Dinosauria, but there are many different species in the larger clade Reptilia. Dinosauria is a member of the Reptilia clade.

PTS: 1 DIF: L2 REF: p. 547
OBJ: 19.2.1 Identify the processes that influence survival or extinction of a species or clade.
STA: UT.BIO.5.1.a | UT.BIO.5.2.a TOP: Foundation Edition
BLM: synthesis

206. ANS:
The Galápagos finches followed a model known as punctuated equilibrium. In gradualism, species evolve slowly and steadily over a long period of time. In contrast, punctuated equilibrium has long periods of equilibrium broken up ("punctuated") by periods of structural change. During periods of equilibrium, no structural change occurs. These periods of structural change occur relatively fast in the geologic time scale, and usually follow some event that upsets their equilibrium. An event often is a mass extinctions or something that causes the isolation of a small group from the main population. Some biologists think that most new species develop during these periods of change.

PTS: 1 DIF: L3 REF: p. 549
OBJ: 19.2.2 Contrast gradualism and punctuated equilibrium. STA: UT.BIO.5.2.a
BLM: analysis

207. ANS:
A large asteroid probably struck Earth during the Cretaceous. An impact of this size would have thrown large amounts of dust and water into the atmosphere, changing the global climate and causing the mass extinction of many organisms including the dinosaurs.

PTS: 1 DIF: L2 REF: p. 548
OBJ: 19.2.3 Name two important patterns in macroevolution. STA: UT.BIO.5.1.b | UT.BIO.5.2.a
TOP: Foundation Edition BLM: analysis

208. ANS:
Earth probably formed as pieces of cosmic debris were attracted to each other and collided repeatedly over the course of about 100 million years. Collisions between the growing planet and space objects produced an enormous amount of heat that melted the entire globe. While the planet was melted, the elements rearranged themselves according to density, with the most dense at Earth's core. Gradually, Earth became cooler, allowing for permanent liquid oceans and solid rock.

PTS: 1 DIF: L3 REF: p. 553
OBJ: 19.3.1 Identify some of the hypotheses about early Earth and the origin of life.
STA: UT.BIO.2.1.a TOP: Foundation Edition
BLM: synthesis

209. ANS:

The endosymbiotic theory proposes that eukaryotic cells arose from living communities formed by several organisms. About 2 billion years ago, some prokaryotic cells began evolving internal cell membranes. These prokaryotes were 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: L3 REF: p. 556 | p. 557
OBJ: 19.3.2 Explain the endosymbiotic theory. STA: UT.BIO.1.3.a | UT.BIO.5.2.a
TOP: Foundation Edition BLM: synthesis

210. ANS:
Chlamydomonas will evolve more quickly during unfavorable conditions. When an organism reproduces asexually, its offspring genetically identical to the parent. This means that there is little genetic variation within the species. The variation that does occur is primarily caused by mutations in the DNA. In sexual reproduction, offspring are produced by two parents. Since both parents contribute DNA to the offspring and their genes mix and remix during fertilization, the offspring cannot be identical to the parent. Mixing and remixing of genes also occurs during meiosis. The constant mixing of genes causes a great genetic diversity within the species. The greater the genetic diversity, the more adaptable a species is to changing environmental conditions and the more rapidly the species will evolve.

PTS: 1 DIF: L3 REF: p. 558
OBJ: 19.3.3 Explain the significance of sexual reproduction in evolution.
STA: UT.BIO.4.1.b BLM: evaluation