DNA 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. When Griffith mixed heat-killed, harmful bacteria with live, harmless bacteria and injected the mixture into mice, the mice <u>died</u>. _____

____ 2. A bacteriophage is <u>larger</u> than a bacterium. _____

____ 3. Bacteriophages inject <u>protein</u> into bacteria, altering the bacteria's genetic information.
_____

____ 4. The DNA that makes up an organism's genes must be capable of storing, copying, and <u>changing</u> information.
_____

____ 5. DNA is a nucleic acid made up of <u>nucleosomes</u> joined into long strands or chains by covalent bonds.
_____

____ 6. The three parts of a DNA nucleotide are the phosphate group, deoxyribose, and the <u>base</u>.
_____

____ 7. Hershey and Chase made the components of <u>bacteriophages</u> radioactive to learn which part carried genetic information.. _____

____ 8. When <u>Griffith</u> destroyed the DNA in his mixture containing various molecules from heat-killed bacteria, transformation no longer occurred. _____

____ 9. If protein had been responsible for carrying genetic information, Hershey and Chase would have observed that their bacteria were marked with radioactive <u>sulfur</u>. _____

____ 10. Watson and Crick discovered that <u>covalent</u> bonds hold base pairs together at the center of a strand of DNA.
_____

BASE	A	C	G	T
% of Total DNA	22	_	28	_

Figure 12–4

____ 11. In Figure 12–4, the percentages of all four columns should add up to <u>90</u>. _____

____ 12. The replication of a DNA molecule results in <u>four</u> copies of the same gene. _____

____ 13. DNA is tightly wrapped around <u>nucleosomes</u>. _____

____ 14. A DNA strand that had the sequence TACGTT would have a complimentary strand ATCGAT.
_____

____ 15. In eukaryotes, DNA replication proceeds in one direction along the DNA molecule.
_____

____ 16. The three types of RNA are messenger RNA, transfer RNA, and ribosomal RNA.
_____

____ 17. If a nucleic acid contains uracil, it is DNA. _____

____ 18. During DNA replication, only one strand of DNA serves as a template. _____

____ 19. DNA contains the code for the DNA polymerase enzyme. _____

____ 20. A codon consists of four nucleotides. _____

Codons Found in Messenger RNA

First Base	Second Base U	Second Base C	Second Base A	Second Base G	Third Base
U	Phe	Ser	Tyr	Cys	U
	Phe	Ser	Tyr	Cys	C
	Leu	Ser	Stop	Stop	A
	Leu	Ser	Stop	Trp	G
C	Leu	Pro	His	Arg	U
	Leu	Pro	His	Arg	C
	Leu	Pro	Gln	Arg	A
	Leu	Pro	Gln	Arg	G
A	Ile	Thr	Asn	Ser	U
	Ile	Thr	Asn	Ser	C
	Ile	Thr	Lys	Arg	A
	Met	Thr	Lys	Arg	G
G	Val	Ala	Asp	Gly	U
	Val	Ala	Asp	Gly	C
	Val	Ala	Glu	Gly	A
	Val	Ala	Glu	Gly	G

Figure 13–3

____ 21. According to the chart in Figure 13–3, the codes GGA and GGU both code for Ala.
_____

____ 22. The anticodon AGA is complementary to the mRNA codon TCT. _____

____ 23. Genes determine a person's eye color by coding for introns that affect eye color.
_____

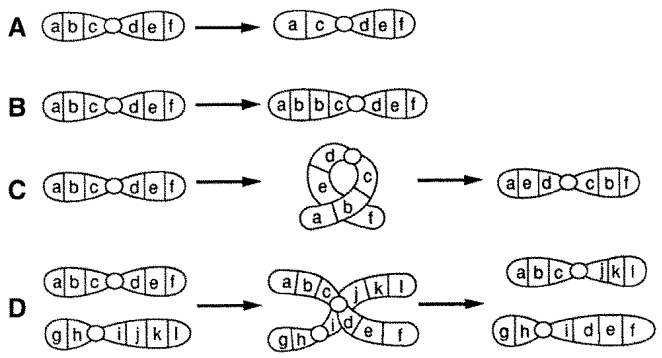

Figure 13–5

____ 24. A deletion mutation is shown in line B of Figure 13–5. _____

____ 25. A translocation mutation is seen in line IV of Figure 13–5. _____

____ 26. DNA binding proteins in prokaryotes regulate gene expression by controlling transcription. _____

____ 27. In prokaryotes, an operon is a group of genes that are regulated together. _____

____ 28. Gene regulation in eukaryotes is less complex than in prokaryotes. _____

____ 29. The TATA box in eukaryotes helps to ensure that transcription occurs correctly. _____

____ 30. You would expect the Hox genes of a mosquito and a rabbit to be very different. _____

Completion
Complete each statement.

31. In Griffith's experiment, he mixed heat-killed S-strain bacteria with live, harmless bacteria from the R-strain. When this mixtured was injected into mice, the mice _____.

Figure 12–6

32. The virus in Figure 12–6 is made of two parts the _____ outside, and the genetic material inside.

33. Eukaryotic DNA molecules need to be carefully copied and sorted, especially in the formation of _____ cells during meiosis.

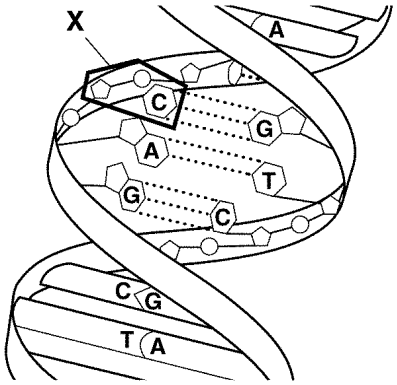

Figure 12–2

34. The structure labeled X in Figure 12–2 is a(an) _____.

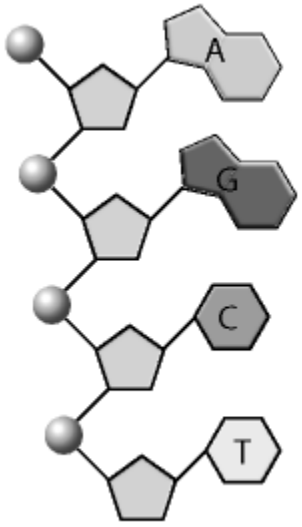

Figure 12–7

35. The matching strand to the one in Figure 12–7, reading from the bottom up, would be _____.

36. The Watson and Crick model of DNA is a(an) _____, in which two strands are wound around each other.

37. In Griffith's experiment, _____ from the harmful bacteria transferred to the harmless bacteria, and transformed them.

38. _____ are weak bonds that hold the two strands of DNA together, but also allow the DNA to separate and replicate.

39. If covalent bonds held the two strands of nucleotides together, the two strands could not easily separate and _____.

Percentages of Bases			
A	**C**	**T**	**G**
30			

Figure 12–8

40. In figure 12–8, the percentage of guanine would be _____.

41. Chromatin contains proteins called _____.

42. DNA replication is carried out by a series of _____.

43. The tips of chromosomes are known as _____.

44. A prokaryotic cell replicates its _____ before it splits to form new cells, so that each new cell can have genetic material.

45. Eukaryotic DNA has more replication forks than prokaryotic DNA, because it has more starting places, or _____.

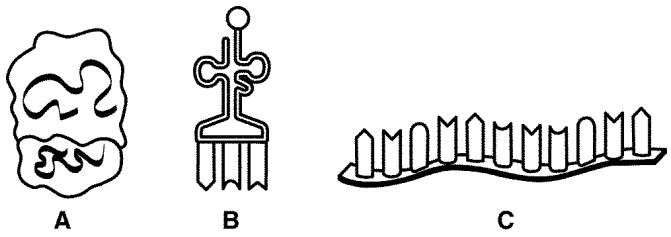

Figure 13–6

46. In Figure 13–6, A, B, and C are three types of _____.

47. In RNA, _____ is the sugar in the nucleotide.

48. A eukaryotic gene consists of regulatory regions, a(an) _____, and the nucleotide sequence that is transcribed.

49. During transcription, _____ binds to DNA and assembles nucleotides into a strand that is complementary to the DNA template.

50. The order of nitrogenous bases in DNA determines the order of _____ in proteins.

51. The codon that signals the end of a growing polypeptide is called a(an) _____.

52. The tRNA bases called the _____ are complementary to three consecutive nucleotides on an mRNA molecule.

53. Two cellular processes, _____ and _____, are the main activities described in the central dogma of molecular biology.

54. Suppose that part of an amino acid sequence of a protein changed from tyrosine-proline-glycine-alanine to tyrosine-histidine-glycine-alanine. This change was most likely caused by a point mutation called a(an) _____.

55. Insertions and deletions that change the entire genetic message that comes after the mutation are called _____.

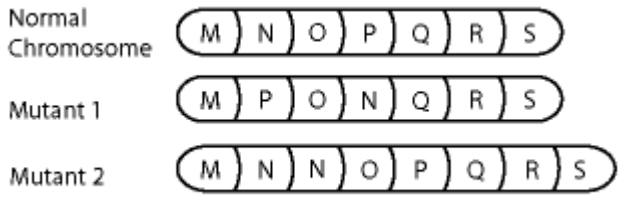

Figure 13–7

56. Mutant 1 in Figure 13–7 is the result of a(n) _____ because part of the chromosome reverses direction.

57. The element bromine can cause a genetic change, so bromine is called a _____.

58. The *lac* repressor releases the operator in the presence of _____.

59. In eukaryotes, transcription factors attract RNA polymerase by binding to _____ sequences in DNA.

60. A mutation in a series of genes called _____ can change the organs that develop in specific parts of an embryo.

Short Answer

61. Explain how the bacteria in Griffith's experiment were transformed.

62. What did Griffith conclude transformed the harmless bacteria in his experiment?

63. What is a bacteriophage?

64. What does DNA do with information?

65. When is DNA's role in transmitting information most important and why?

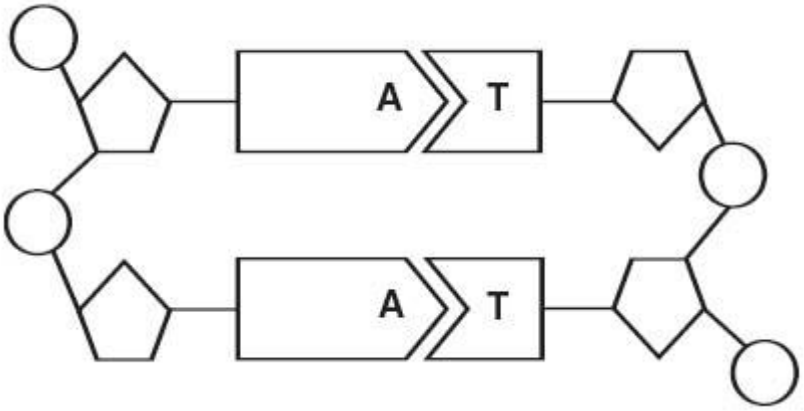

Figure 12–9

66. Identify the three main components in the nucleotides shown in Figure 12–9.

67. What are the roles of covalent bonds and hydrogen bonds in the structure of DNA?

68. How did Avery build on Griffith's work?

69. How did Hershey and Chase know that it was the DNA that had infected the bacterial cells in their experiment?

70. How did Avery determine that DNA was the molecule carried the genes for transformation?

71. How did X-ray technology enable scientists to better understand the structure of DNA?

72. If the percentage of guanine in the DNA of a certain species decreased by 5 percent over time, what would you expect to have happened to the percentage of adenine in that DNA?

73. During DNA replication, what two processes must occur before the two strands of a DNA molecule can separate?

Figure 12–10

74. Identify and explain the role of the molecule, represented by the spheres in Figure 12–10.

75. Identify one difference between prokaryotic and eukaryotic DNA replication.

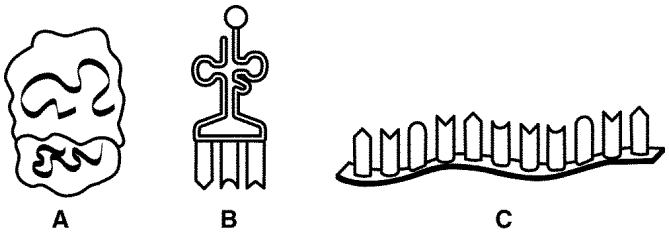

Figure 13–6

76. What is molecule B in Figure 13–6, and what is its function?

77. What are the three main parts of an RNA nucleotide?

78. What might be the effect of a mutation in the promoter sequence of a gene?

79. What must happen to a DNA molecule before RNA polymerase can begin to assemble nucleotides into a new RNA strand?

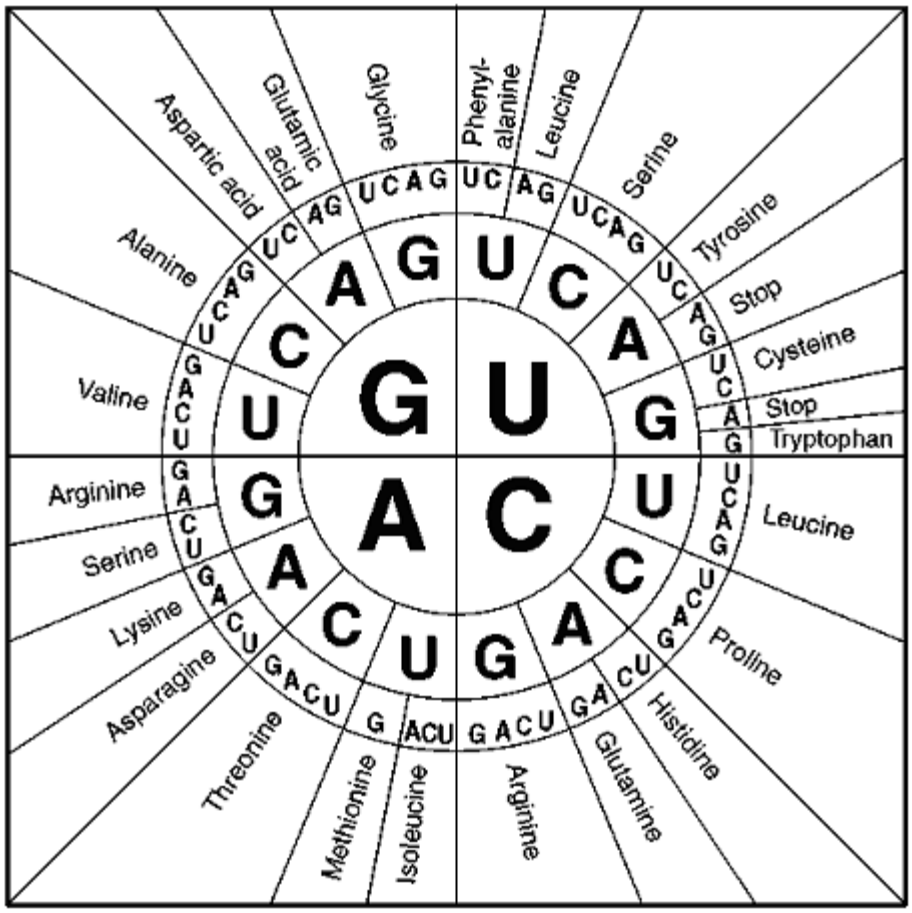

Figure 13–2

80. According to Figure 13–2, what codons specify the amino acid glycine?

81. How many amino acids could be specified if codons consisted of two nucleotides instead of three? What problem would this present for an organism making proteins using all 20 amino acids?

82. What causes translation to stop?

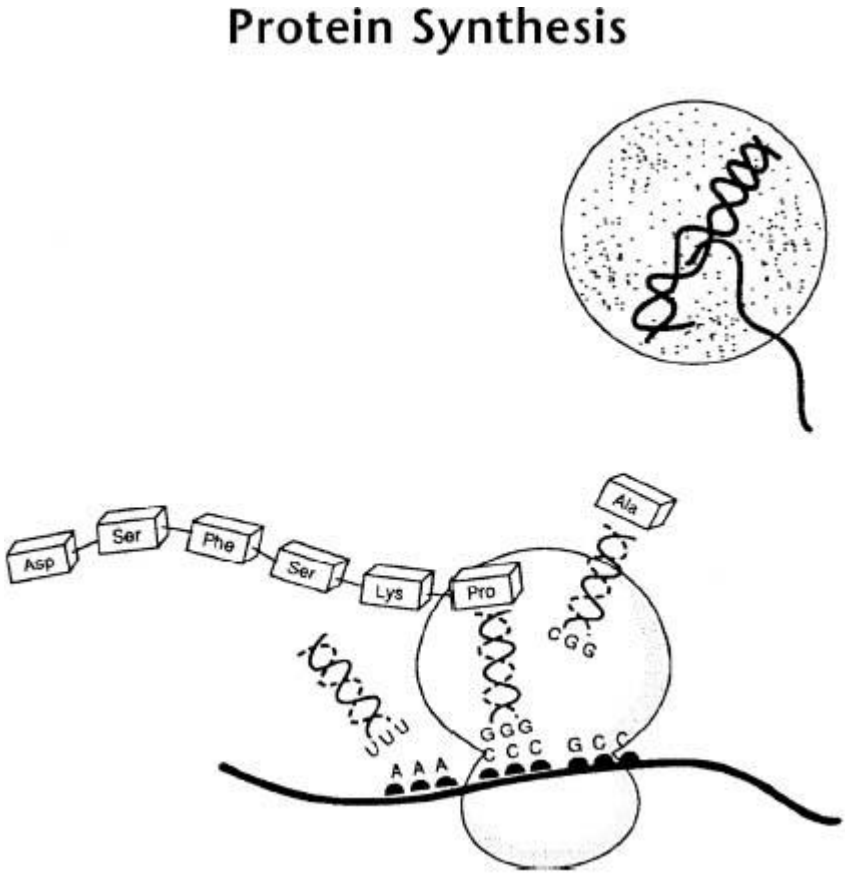

Figure 13–8

83. Describe the functions of the three kinds of RNA illustrated in Figure 13–8.

84. What is the central dogma of molecular biology?

85. What is a polyploid organism?

86. What is one beneficial mutations that has happened in humans?

87. What happens to *lac* repressors in *E. coli* when lactose is present?

88. How does miRNA function to help block gene expression?

89. Explain why the Hox genes that are found in different animals are so similar to each other.

90. How do internal and external factors work together to regulate gene expression in the metamorphosis of a frog?

Other

Griffith's Experiments

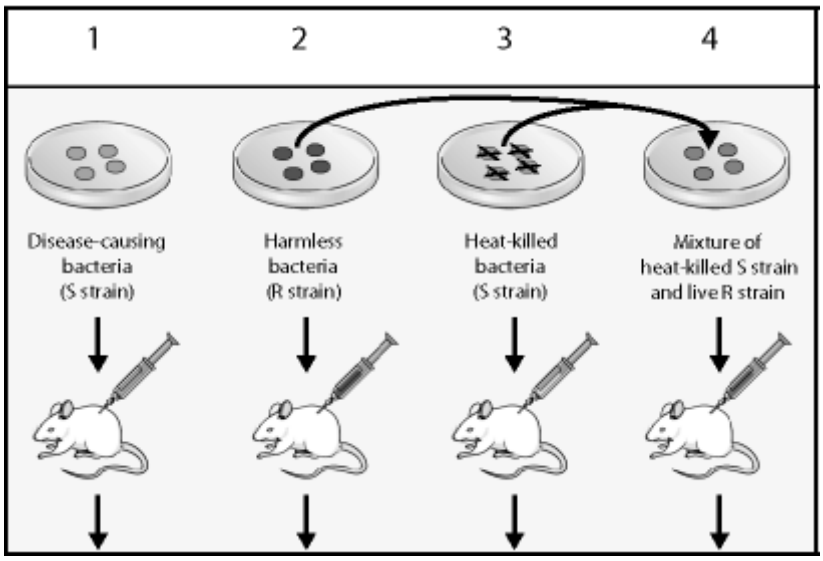

Figure 12–11

91. **Interpret Visuals** What process did Griffith identify in the series of experiments in Figure 12–11?

92. **Compare and Contrast** In which experiments in Figure 12–11 do the mice live?

93. **Explain** What happened to the bacteria and the mice in experiment 4, in Figure 12–11?

94. **Predict** What would happen if Griffith took some of the bacteria from Experiment 4 in Figure 12–11, grew them on culture plates, killed them with heat, and mixed them with harmless bacteria? How could he test this hypothesis?

95. **Infer** What can you infer about DNA and the bacterial cell membrane from Griffith's experiments in Figure 12–11?

Percentages of Bases in Five Organisms				
Source of DNA	A	T	G	C
Streptococcus	29.8		20.5	18.0
Yeast	31.3		18.7	17.1
Herring				22.6
Human		29.4		19.8

Figure 12–12

96. **Interpret Tables** In Figure 12–12, what do the A, T, G and C stand for?

97. **Calculate** In Figure 12–12, what percentage of thymine would you expect in yeast?

98. **Calculate** Approximately what percentage of adenine would you expect to find in herring in Figure 12–12?

99. **Predict** If the level of thymine in humans were 34 percent instead of 29.4, would you expect the levels of guanine and cytosine to rise or fall, compared to the values in the table in Figure 12–12?

100. **Relate Cause and Effect** In the last row of Figure 12–12, notice that the values adenine and cytosine are very different. If the value for adenine is high, does the value of cytosine have to be low? Explain your answer.

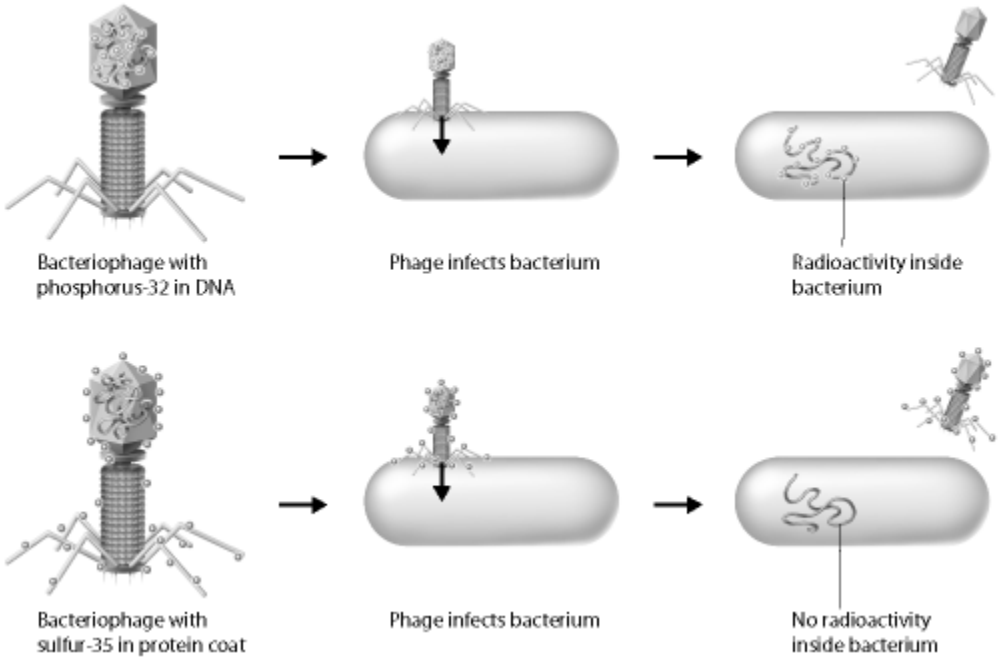

Figure 12–13

101. **Interpret Visuals** Who first did the experiments in Figure 12–13 and what did they confirm?

102. **Infer** Since both the protein and the DNA in Figure 12–13 were both radioactively labeled, how did the scientists determine that DNA was the material that infects the cell?

103. **Predict** What would the scientists have found if protein in Figure 12–13 had been the carrier of genetic information?

104. **Infer** In Griffith's transformation experiments, the DNA from one organism had to function in another. Did the DNA in the experiments in Figure 12–13 have to make new bacteriophages in the bacteria for the scientists to draw their conclusion? Explain your answer.

105. **Evaluate** What is the benefit gained if the experiments in Figure 12–13 point to the same conclusions that other scientists already established in other experiments?

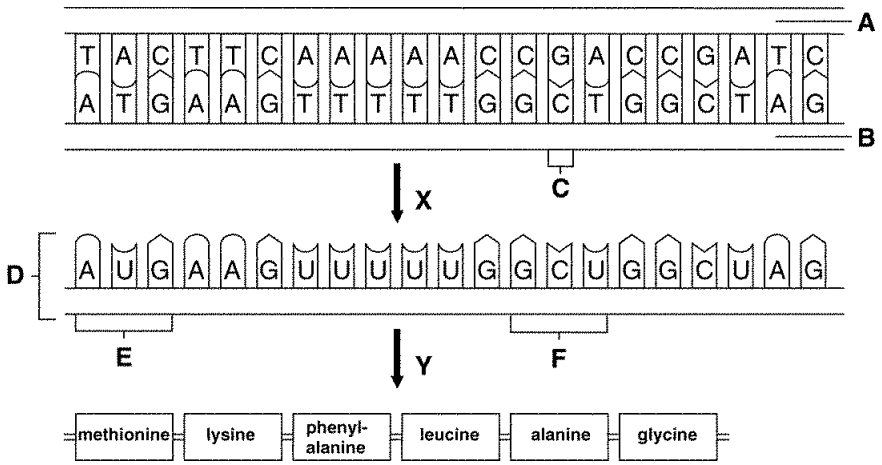

Figure 13–9

106. **Infer** From which labeled structure in Figure 13–9 is structure D made? Identify that labeled structure.

107. **Interpret Visuals** Identify structure F in Figure 13–9. What does it specify?

108. **Interpret Visuals** What is structure E in Figure 13–9? What does it specify?

109. **Predict** What would happen to structure F in Figure 13–9 if structure C were deleted?

110. **Predict** In Figure 13–9, what effect would the deletion of structure C have on the process that occurs during step Y?

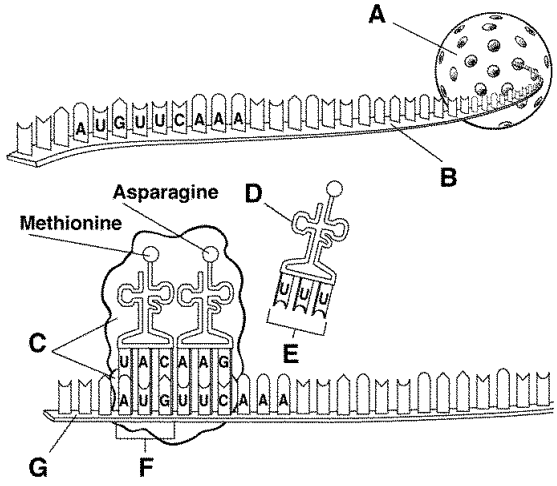

Figure 13–10

111. **Interpret Visuals** What process is illustrated in Figure 13–10?

112. **Interpret Visuals** Identify structure C in Figure 13–10.

113. **Interpret Visuals** Which labeled structure in Figure 13–10 is a codon?

114. **Infer** What is the relationship between the codons and anticodons? How is this relationship important to the structure of proteins? Use Figure 13–10 to explain your answer.

115. **Predict** In Figure 13–10, what will happen after the ribosome joins the methionine and phenylalanine?

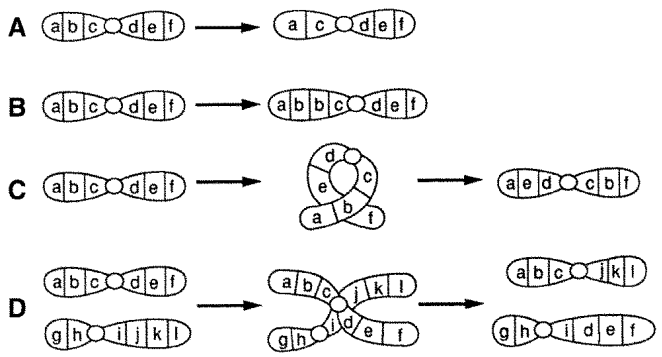

Figure 13–5

116. **Classify** What term describes the general type of mutation occurring in A, B, C, and D in Figure 13–5?

117. **Interpret Visuals** In Figure 13–5, which process or processes involve two chromosomes?

118. **Compare and Contrast** Contrast process A and process B in Figure 13–5.

119. **Interpret Visuals** During which process in Figure 13–5 does a segment of a chromosome become oriented in the reverse direction?

120. **Interpret Visuals** In Figure 13–5, which process is a translocation?

Essay

121. How did Griffith arrive at the conclusion that a gene from one kind of bacteria transformed another kind of bacteria?

122. In what way did using a bacteriophage in an experiment on transformation make the Hershey-Chase investigation simpler than Avery's investigation?

123. What are the roles of DNA in heredity? Predict what would happen to each of the roles if a mistake were made in the genetic code.

124. How is DNA like a book? Explain your answer.

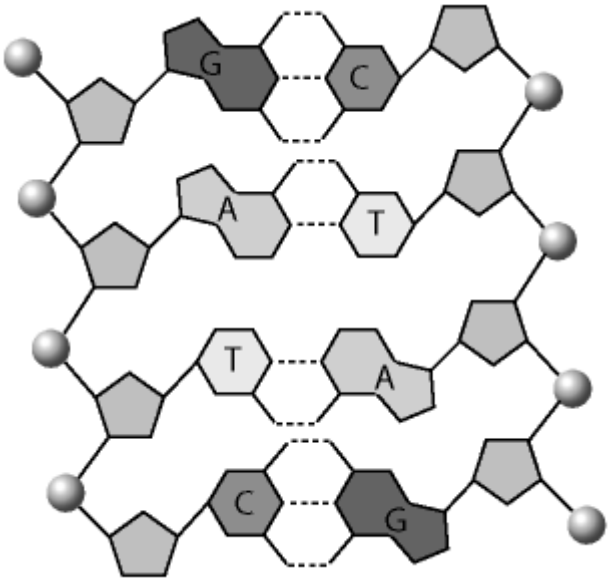

Figure 12–14

125. Figure 12–14 shows a short segment of DNA. Explain how the chemical components of a nucleotide give DNA a structure that allows it to hold itself together and yet come apart for replication.

126. Describe the Hershey-Chase experiment. Why were the results important?

127. Describe the structure of a DNA molecule.

128. If you unraveled a eukaryotic chromosome, what would you observe as it became unraveled?

129. Compare and contrast DNA replication in prokaryotes and eukaryotes.

130. Describe how two chromosomes separate after replication in a prokaryotic cell versus a eukaryotic cell?

131. Contrast the functions of the three main types of RNA.

132. How does transcription differ from DNA replication? Describe at least four differences.

133. Describe the process in which a molecule of pre-mRNA is converted into a final mRNA molecule.

Codons Found in Messenger RNA

First Base	Second Base: U	Second Base: C	Second Base: A	Second Base: G	Third Base
U	Phe	Ser	Tyr	Cys	U
	Phe	Ser	Tyr	Cys	C
	Leu	Ser	Stop	Stop	A
	Leu	Ser	Stop	Trp	G
C	Leu	Pro	His	Arg	U
	Leu	Pro	His	Arg	C
	Leu	Pro	Gln	Arg	A
	Leu	Pro	Gln	Arg	G
A	Ile	Thr	Asn	Ser	U
	Ile	Thr	Asn	Ser	C
	Ile	Thr	Lys	Arg	A
	Met	Thr	Lys	Arg	G
G	Val	Ala	Asp	Gly	U
	Val	Ala	Asp	Gly	C
	Val	Ala	Glu	Gly	A
	Val	Ala	Glu	Gly	G

Figure 13–3

134. Some substitution mutations have no effect on the final protein that is assembled by the ribosome. Use Figure 13–3 to provide specific examples that explain how having multiple codons specify the same amino acid makes this possible.

135. Explain the process of translation.

136. Why do some kinds of point mutations generally result in greater changes in proteins than others?

137. Why is pesticide resistance considered a beneficial mutation in mosquitoes?

138. What might be the effects of a mutation in the gene that codes for the *lac* repressor in *E. coli*?

139. How do eukaryotic cells regulate gene expression?

140. Why is gene regulation necessary in the development of multicellular organisms? Use a specific example to support your argument.

DNA Unit Practice Test
Answer Section

MODIFIED TRUE/FALSE

1. ANS: T PTS: 1 DIF: L1
   REF: p. 338 | p. 339 OBJ: 12.1.1 Summarize the process of bacterial transformation.
   STA: UT.BIO.2.1.d TOP: Foundation Edition
   BLM: knowledge
2. ANS: F, smaller

   PTS: 1 DIF: L1 REF: p. 340
   OBJ: 12.1.2 Describe the role of bacteriophages in identifying genetic material.
   STA: UT.BIO.4.3.b | UT.BIO.4.3.e TOP: Foundation Edition
   BLM: evaluation
3. ANS: F, DNA, genetic material

   PTS: 1 DIF: L1 REF: p. 340 | p. 341
   OBJ: 12.1.2 Describe the role of bacteriophages in identifying genetic material.
   STA: UT.BIO.4.3.b | UT.BIO.4.3.e TOP: Foundation Edition
   BLM: comprehension
4. ANS: F, transmitting

   PTS: 1 DIF: L2 REF: p. 342 | p. 343
   OBJ: 12.1.3 Identify the role of DNA in heredity. STA: UT.BIO.4.3.b | UT.BIO.4.3.c
   TOP: Foundation Edition BLM: comprehension
5. ANS: F, nucleotides

   PTS: 1 DIF: L1 REF: p. 333
   OBJ: 12.2.1 Identify the chemical components of DNA. STA: UT.BIO.4.3.a
   TOP: Foundation Edition BLM: knowledge
6. ANS: T PTS: 1 DIF: L2
   REF: p. 344 | p. 345 OBJ: 12.2.1 Identify the chemical components of DNA.
   STA: UT.BIO.4.3.a TOP: Foundation Edition
   BLM: comprehension
7. ANS: T PTS: 1 DIF: L2
   REF: p. 340 | p. 341
   OBJ: 12.2.2 Discuss the experiments leading to the identification of DNA as the molecule that carries the genetic code. STA: UT.BIO.4.3.a | UT.BIO.4.3.e TOP: Foundation Edition
   BLM: comprehension
8. ANS: F, Avery

   PTS: 1 DIF: L3 REF: p. 338 | p. 339 | p. 340
   OBJ: 12.2.2 Discuss the experiments leading to the identification of DNA as the molecule that carries the genetic code. STA: UT.BIO.4.3.a | UT.BIO.4.3.e TOP: Foundation Edition
   BLM: analysis
9. ANS: T PTS: 1 DIF: L3
   REF: p. 341

OBJ: 12.2.2 Discuss the experiments leading to the identification of DNA as the molecule that carries the genetic code. STA: UT.BIO.4.3.a | UT.BIO.4.3.e BLM: analysis

10. ANS: F, hydrogen

PTS: 1 DIF: L1 REF: p. 348
OBJ: 12.2.3 Describe the steps leading to the development of the double-helix model of DNA.
STA: UT.BIO.4.3.a | UT.BIO.4.3.e TOP: Foundation Edition
BLM: knowledge

11. ANS: F, 100%

PTS: 1 DIF: L3 REF: p. 345
OBJ: 12.2.3 Describe the steps leading to the development of the double-helix model of DNA.
STA: UT.BIO.4.3.a | UT.BIO.4.3.e TOP: Foundation Edition
BLM: analysis

12. ANS: F, two

PTS: 1 DIF: L2 REF: p. 350
OBJ: 12.3.1 Summarize the events of DNA replication. STA: UT.BIO.4.3.b
TOP: Foundation Edition BLM: application

13. ANS: F, histones

PTS: 1 DIF: L2 REF: p. 352
OBJ: 12.3.1 Summarize the events of DNA replication. STA: UT.BIO.4.3.b
BLM: analysis

14. ANS: F, ATGCAA

PTS: 1 DIF: L3 REF: p. 350
OBJ: 12.3.1 Summarize the events of DNA replication. STA: UT.BIO.4.3.b
TOP: Foundation Edition BLM: application

15. ANS: F, two directions

PTS: 1 DIF: L2 REF: p. 352 | p. 353
OBJ: 12.3.2 Compare DNA replication in prokaryotes with that of eukaryotes
STA: UT.BIO.4.3.b TOP: Foundation Edition
BLM: comprehension

16. ANS: T PTS: 1 DIF: L2
REF: p. 363 OBJ: 13.1.1 Contrast RNA and DNA. STA: UT.BIO.4.3.a
TOP: Foundation Edition BLM: knowledge

17. ANS: F, RNA

PTS: 1 DIF: L2 REF: p. 362 OBJ: 13.1.1 Contrast RNA and DNA.
STA: UT.BIO.4.3.a BLM: application

18. ANS: F, RNA transcription

PTS: 1 DIF: L2 REF: p. 364
OBJ: 13.1.2 Explain the process of transcription. STA: UT.BIO.4.3.c
TOP: Foundation Edition BLM: comprehension

19. ANS: T PTS: 1 DIF: L2
REF: p. 366 OBJ: 13.2.1 Identify the genetic code and explain how it is read.
STA: UT.BIO.4.3.a TOP: Foundation Edition

BLM: analysis

20. ANS: F, three

PTS: 1 DIF: L1 REF: p. 366
OBJ: 13.2.1 Identify the genetic code and explain how it is read.
STA: UT.BIO.4.3.a TOP: Foundation Edition
BLM: knowledge

21. ANS: F, Gly

PTS: 1 DIF: L3 REF: p. 367
OBJ: 13.2.1 Identify the genetic code and explain how it is read.
STA: UT.BIO.4.3.a BLM: application

22. ANS: F, UCU

PTS: 1 DIF: L2 REF: p. 368 | p. 369
OBJ: 13.2.2 Summarize the process of translation. STA: UT.BIO.4.3.c
TOP: Foundation Edition BLM: application

23. ANS: F, proteins

PTS: 1 DIF: L2 REF: p. 370
OBJ: 13.2.3 Describe the "central dogma" of molecular biology.
STA: UT.BIO.4.3.c TOP: Foundation Edition
BLM: comprehension

24. ANS: F, duplication

PTS: 1 DIF: L2 REF: p. 374
OBJ: 13.3.1 Define mutations and describe the different types of mutations.
STA: UT.BIO.4.3.d TOP: Foundation Edition
BLM: application

25. ANS: T PTS: 1 DIF: L3
REF: p. 374 OBJ: 13.3.1 Define mutations and describe the different types of mutations.
STA: UT.BIO.4.3.d BLM: analysis

26. ANS: T PTS: 1 DIF: L2
REF: p. 377 OBJ: 13.4.1 Describe gene regulation in prokaryotes.
STA: UT.BIO.2.1.b BLM: comprehension

27. ANS: T PTS: 1 DIF: L1
REF: p. 377 OBJ: 13.4.1 Describe gene regulation in prokaryotes.
STA: UT.BIO.2.1.b TOP: Foundation Edition
BLM: knowledge

28. ANS: F, more

PTS: 1 DIF: L1 REF: p. 379
OBJ: 13.4.2 Explain how most eukaryotic genes are regulated. STA: UT.BIO.2.1.b
TOP: Foundation Edition BLM: knowledge

29. ANS: T PTS: 1 DIF: L2
REF: p. 379 OBJ: 13.4.2 Explain how most eukaryotic genes are regulated.
STA: UT.BIO.2.1.b BLM: synthesis

30. ANS: F, similar

PTS: 1 DIF: L3 REF: p. 382

OBJ: 13.4.3 Relate gene regulation to development in multicellular organisms.
STA: UT.BIO.2.1.b | UT.BIO.2.3.a BLM: synthesis

COMPLETION

31. ANS: developed pneumonia, died

PTS: 1 DIF: L2 REF: p. 339
OBJ: 12.1.1 Summarize the process of bacterial transformation.
STA: UT.BIO.2.1.d TOP: Foundation Edition
BLM: comprehension

32. ANS: protein coat

PTS: 1 DIF: L1 REF: p. 340
OBJ: 12.1.2 Describe the role of bacteriophages in identifying genetic material.
STA: UT.BIO.4.3.b | UT.BIO.4.3.e TOP: Foundation Edition
BLM: knowledge

33. ANS: reproductive

PTS: 1 DIF: L2 REF: p. 343
OBJ: 12.1.3 Identify the role of DNA in heredity. STA: UT.BIO.4.3.b | UT.BIO.4.3.c
BLM: analysis

34. ANS: nucleotide

PTS: 1 DIF: L2 REF: p. 345
OBJ: 12.2.1 Identify the chemical components of DNA. STA: UT.BIO.4.3.a
TOP: Foundation Edition BLM: comprehension

35. ANS: AGCT

PTS: 1 DIF: L3 REF: p. 345
OBJ: 12.2.1 Identify the chemical components of DNA. STA: UT.BIO.4.3.a
TOP: Foundation Edition BLM: application

36. ANS: double helix

PTS: 1 DIF: L1 REF: p. 347
OBJ: 12.2.2 Discuss the experiments leading to the identification of DNA as the molecule that carries the genetic code. STA: UT.BIO.4.3.a | UT.BIO.4.3.e TOP: Foundation Edition
BLM: knowledge

37. ANS: DNA, genes

PTS: 1 DIF: L2 REF: p. 338 | p. 339
OBJ: 12.2.2 Discuss the experiments leading to the identification of DNA as the molecule that carries the genetic code. STA: UT.BIO.4.3.a | UT.BIO.4.3.e TOP: Foundation Edition
BLM: analysis

38. ANS: Hydrogen bonds

PTS: 1 DIF: L2 REF: p. 348
OBJ: 12.2.3 Describe the steps leading to the development of the double-helix model of DNA.
STA: UT.BIO.4.3.a | UT.BIO.4.3.e TOP: Foundation Edition

BLM: knowledge

39. ANS: replicate

PTS: 1 DIF: L3 REF: p. 348
OBJ: 12.2.3 Describe the steps leading to the development of the double-helix model of DNA.
STA: UT.BIO.4.3.a | UT.BIO.4.3.e TOP: Foundation Edition
BLM: evaluation

40. ANS: 20%

PTS: 1 DIF: L3 REF: p. 345
OBJ: 12.2.3 Describe the steps leading to the development of the double-helix model of DNA.
STA: UT.BIO.4.3.a | UT.BIO.4.3.e TOP: Foundation Edition
BLM: analysis

41. ANS: histones

PTS: 1 DIF: L1 REF: p. 352
OBJ: 12.3.1 Summarize the events of DNA replication. STA: UT.BIO.4.3.b
BLM: knowledge

42. ANS: enzymes

PTS: 1 DIF: L2 REF: p. 351
OBJ: 12.3.1 Summarize the events of DNA replication. STA: UT.BIO.4.3.b
TOP: Foundation Edition BLM: analysis

43. ANS: telomeres

PTS: 1 DIF: L1 REF: p. 352
OBJ: 12.3.1 Summarize the events of DNA replication. STA: UT.BIO.4.3.b
TOP: Foundation Edition BLM: knowledge

44. ANS: DNA, chromosome

PTS: 1 DIF: L2 REF: p. 353
OBJ: 12.3.2 Compare DNA replication in prokaryotes with that of eukaryotes
STA: UT.BIO.4.3.b TOP: Foundation Edition
BLM: synthesis

45. ANS: origins of replication

PTS: 1 DIF: L3 REF: p. 353
OBJ: 12.3.2 Compare DNA replication in prokaryotes with that of eukaryotes
STA: UT.BIO.4.3.b BLM: synthesis

46. ANS: RNA

PTS: 1 DIF: L2 REF: p. 363 OBJ: 13.1.1 Contrast RNA and DNA.
STA: UT.BIO.4.3.a TOP: Foundation Edition
BLM: application

47. ANS: ribose

PTS: 1 DIF: L1 REF: p. 362 OBJ: 13.1.1 Contrast RNA and DNA.
STA: UT.BIO.4.3.a TOP: Foundation Edition
BLM: knowledge

48. ANS: promoter

PTS: 1 DIF: L2 REF: p. 365
OBJ: 13.1.2 Explain the process of transcription. STA: UT.BIO.4.3.c
BLM: comprehension

49. ANS: RNA polymerase

PTS: 1 DIF: L2 REF: p. 364
OBJ: 13.1.2 Explain the process of transcription. STA: UT.BIO.4.3.c
TOP: Foundation Edition BLM: application

50. ANS: amino acids

PTS: 1 DIF: L2 REF: p. 336
OBJ: 13.2.1 Identify the genetic code and explain how it is read.
STA: UT.BIO.4.3.a TOP: Foundation Edition
BLM: comprehension

51. ANS: stop codon

PTS: 1 DIF: L1 REF: p. 367
OBJ: 13.2.2 Summarize the process of translation. STA: UT.BIO.4.3.c
TOP: Foundation Edition BLM: knowledge

52. ANS: anticodons

PTS: 1 DIF: L2 REF: p. 369
OBJ: 13.2.2 Summarize the process of translation. STA: UT.BIO.4.3.c
TOP: Foundation Edition BLM: comprehension

53. ANS: transcription, translation

PTS: 1 DIF: L3 REF: p. 370 | p. 371
OBJ: 13.2.3 Describe the "central dogma" of molecular biology.
STA: UT.BIO.4.3.c BLM: synthesis

54. ANS: substitution

PTS: 1 DIF: L3 REF: p. 372 | p. 373
OBJ: 13.3.1 Define mutations and describe the different types of mutations.
STA: UT.BIO.4.3.d BLM: evaluation

55. ANS: frameshift mutations

PTS: 1 DIF: L2 REF: p. 373
OBJ: 13.3.1 Define mutations and describe the different types of mutations.
STA: UT.BIO.4.3.d TOP: Foundation Edition
BLM: comprehension

56. ANS: inversion

PTS: 1 DIF: L2 REF: p. 374
OBJ: 13.3.1 Define mutations and describe the different types of mutations.
STA: UT.BIO.4.3.d TOP: Foundation Edition
BLM: application

57. ANS: mutagen

PTS: 1 DIF: L3 REF: p. 375

OBJ: 13.3.2 Describe the effects mutations can have on genes. STA: UT.BIO.4.3.d
BLM: evaluation

58. ANS: lactose

PTS: 1 DIF: L2 REF: p. 378
OBJ: 13.4.1 Describe gene regulation in prokaryotes. STA: UT.BIO.2.1.b
TOP: Foundation Edition BLM: application

59. ANS: enhancer

PTS: 1 DIF: L2 REF: p. 379
OBJ: 13.4.2 Explain how most eukaryotic genes are regulated. STA: UT.BIO.2.1.b
BLM: comprehension

60. ANS: Hox genes

PTS: 1 DIF: L1 REF: p. 382
OBJ: 13.4.3 Relate gene regulation to development in multicellular organisms.
STA: UT.BIO.2.1.b | UT.BIO.2.3.a TOP: Foundation Edition
BLM: knowledge

SHORT ANSWER

61. ANS:
The harmless living bacteria took in pneumonia-causing DNA (genes) from the heat-killed, pneumonia-causing bacteria, as a result of which the harmless bacteria changed into bacteria that cause pneumonia.

PTS: 1 DIF: L3 REF: p. 350 | p. 351
OBJ: 12.1.1 Summarize the process of bacterial transformation.
STA: UT.BIO.2.1.d BLM: synthesis

62. ANS:
He concluded that a chemical factor, a gene, had transformed the bacteria.

PTS: 1 DIF: L1 REF: p. 339
OBJ: 12.1.1 Summarize the process of bacterial transformation.
STA: UT.BIO.2.1.d TOP: Foundation Edition
BLM: comprehension

63. ANS:
A bacteriophage is a kind of virus that infects and kills bacteria.

PTS: 1 DIF: L1 REF: p. 340
OBJ: 12.1.2 Describe the role of bacteriophages in identifying genetic material.
STA: UT.BIO.4.3.b | UT.BIO.4.3.e TOP: Foundation Edition
BLM: comprehension

64. ANS:
DNA stores, copies, and transmits information.

PTS: 1 DIF: L1 REF: p. 342 | p. 343
OBJ: 12.1.3 Identify the role of DNA in heredity. STA: UT.BIO.4.3.b | UT.BIO.4.3.c
TOP: Foundation Edition BLM: knowledge

65. ANS:
It is most important during the formation of reproductive cells, because the loss of any genetic material then means the loss of valuable information for offspring.

PTS: 1 DIF: L2 REF: p. 343
OBJ: 12.1.3 Identify the role of DNA in heredity. STA: UT.BIO.4.3.b | UT.BIO.4.3.c
BLM: synthesis

66. ANS:
The circles are the phosphate group, the pentagons are deoxyribose, and the A and T (adenosine and thymine) are the bases.

PTS: 1 DIF: L2 REF: p. 345
OBJ: 12.2.1 Identify the chemical components of DNA. STA: UT.BIO.4.3.a
TOP: Foundation Edition BLM: application

67. ANS:
The nucleotides in a strand of DNA are joined by covalent bonds between their sugar and phosphate groups, and by hydrogen bonds between the complimentary bases.

PTS: 1 DIF: L3 REF: p. 344
OBJ: 12.2.1 Identify the chemical components of DNA. STA: UT.BIO.4.3.a
TOP: Foundation Edition BLM: synthesis

68. ANS:
Avery repeated Griffith's experiment, and identified the component of the cell that caused transformation.

PTS: 1 DIF: L3 REF: p. 338| p. 339
OBJ: 12.2.2 Discuss the experiments leading to the identification of DNA as the molecule that carries the genetic code. STA: UT.BIO.4.3.a | UT.BIO.4.3.e TOP: Foundation Edition
BLM: synthesis

69. ANS:
Hershey and Chase labeled the DNA of a bacteriophage with ^{32}P, and found that after the bacteria were infected with the bacteriophage, the ^{32}P was in the bacteria.

PTS: 1 DIF: L1 REF: p. 341
OBJ: 12.2.2 Discuss the experiments leading to the identification of DNA as the molecule that carries the genetic code. STA: UT.BIO.4.3.a | UT.BIO.4.3.e TOP: Foundation Edition
BLM: comprehension

70. ANS:
He systematically destroyed all the other kinds of molecules besides DNA in the dead-cell mixture before using the mixture to successfully transform harmless bacteria into helpful bacteria.

PTS: 1 DIF: L2 REF: p. 340
OBJ: 12.2.2 Discuss the experiments leading to the identification of DNA as the molecule that carries the genetic code. STA: UT.BIO.4.3.a | UT.BIO.4.3.e TOP: Foundation Edition
BLM: synthesis

71. ANS:
Rosalind Franklin used powerful X-ray beams to make diffraction photographs that gave Watson and Crick the clues they needed to determine DNA's structure.

PTS: 1 DIF: L2 REF: p. 346 | p. 347
OBJ: 12.2.3 Describe the steps leading to the development of the double-helix model of DNA.

STA: UT.BIO.4.3.a | UT.BIO.4.3.e TOP: Foundation Edition
BLM: synthesis

72. ANS:
The percentage of adenine would have increased by about 5 percent.

PTS: 1 DIF: L3 REF: p. 345
OBJ: 12.2.3 Describe the steps leading to the development of the double-helix model of DNA.
STA: UT.BIO.4.3.a | UT.BIO.4.3.e BLM: analysis

73. ANS:
The hydrogen bonds between the base pairs must be broken, and the molecule must unwind.

PTS: 1 DIF: L2 REF: p. 350| p. 351
OBJ: 12.3.1 Summarize the events of DNA replication. STA: UT.BIO.4.3.b
TOP: Foundation Edition BLM: analysis

74. ANS:
The molecule is DNA polymerase, an enzyme that joins individual nucleotides to make a strand of DNA.

PTS: 1 DIF: L1 REF: p. 351
OBJ: 12.3.1 Summarize the events of DNA replication. STA: UT.BIO.4.3.b
TOP: Foundation Edition BLM: knowledge

75. ANS:
In prokaryotes, DNA replication starts in one place, and in eukaryotes DNA replication starts in many places.

PTS: 1 DIF: L1 REF: p. 353
OBJ: 12.3.2 Compare DNA replication in prokaryotes with that of eukaryotes
STA: UT.BIO.4.3.b TOP: Foundation Edition
BLM: knowledge

76. ANS:
Molecule B is tRNA, which carries amino acids to the ribosomes.

PTS: 1 DIF: L2 REF: p. 363 | p. 364
OBJ: 13.1.1 Contrast RNA and DNA. STA: UT.BIO.4.3.a
TOP: Foundation Edition BLM: analysis

77. ANS:
A ribose molecule, a phosphate group, and a nitrogenous base are the three main parts of an RNA nucleotide.

PTS: 1 DIF: L1 REF: p. 362 OBJ: 13.1.1 Contrast RNA and DNA.
STA: UT.BIO.4.3.a TOP: Foundation Edition
BLM: knowledge

78. ANS:
RNA polymerase might be unable to bind to the promoter, and, as a result, the gene would not be transcribed.

PTS: 1 DIF: L3 REF: p. 364 | p. 365
OBJ: 13.1.2 Explain the process of transcription. STA: UT.BIO.4.3.c
BLM: synthesis

79. ANS:
The DNA molecule must be separated into two strands.

PTS: 1 DIF: L2 REF: p. 364
OBJ: 13.1.2 Explain the process of transcription. STA: UT.BIO.4.3.c

TOP: Foundation Edition BLM: comprehension

80. ANS:
GGU, GGC, GGA, and GGG specify glycine.

PTS: 1 DIF: L2 REF: p. 367
OBJ: 13.2.1 Identify the genetic code and explain how it is read.
STA: UT.BIO.4.3.a BLM: application

81. ANS:
There could be 16 combinations of nucleotides, which is too few combinations for all 20 amino acid to have a unique code.

PTS: 1 DIF: L3 REF: p. 366 | p. 367
OBJ: 13.2.1 Identify the genetic code and explain how it is read.
STA: UT.BIO.4.3.a BLM: evaluation

82. ANS:
A stop codon on the mRNA causes translation to stop.

PTS: 1 DIF: L1 REF: p. 367
OBJ: 13.2.2 Summarize the process of translation. STA: UT.BIO.4.3.c
TOP: Foundation Edition BLM: knowledge

83. ANS:
Messenger RNA provides the code for the translation, ribosomal RNA reads the code, and a tRNA molecule brings the next amino acid specified by the code.

PTS: 1 DIF: L2 REF: p. 368 | p. 369
OBJ: 13.2.2 Summarize the process of translation. STA: UT.BIO.4.3.c
BLM: comprehension

84. ANS:
Information is transferred from DNA to RNA to protein.

PTS: 1 DIF: L1 REF: p. 363
OBJ: 13.2.3 Describe the "central dogma" of molecular biology.
STA: UT.BIO.4.3.c TOP: Foundation Edition
BLM: comprehension

85. ANS:
A polyploid organism is one that has many sets of chromosomes.

PTS: 1 DIF: L2 REF: p. 376
OBJ: 13.3.1 Define mutations and describe the different types of mutations.
STA: UT.BIO.4.3.d TOP: Foundation Edition
BLM: comprehension

86. ANS:
Sample answer: Mutations in humans have resulted in stronger bones and better disease resistance.

PTS: 1 DIF: L2 REF: p. 376
OBJ: 13.3.2 Describe the effects mutations can have on genes. STA: UT.BIO.4.3.d
TOP: Foundation Edition BLM: knowledge

87. ANS:
The lactose binds to the *lac* repressors, causing the repressors to release the operator.

PTS: 1 DIF: L2 REF: p. 377 | p. 378
OBJ: 13.4.1 Describe gene regulation in prokaryotes. STA: UT.BIO.2.1.b
BLM: application

88. ANS:
A molecule of miRNA is a small loop of RNA that combines with proteins to create a silencing complex that binds to and destroys mRNA that matches the miRNA's sequence.

PTS: 1 DIF: L3 REF: p. 380
OBJ: 13.4.2 Explain how most eukaryotic genes are regulated. STA: UT.BIO.2.1.b
BLM: synthesis

89. ANS:
The Hox genes descended from the genes of common ancestors.

PTS: 1 DIF: L2 REF: p. 382
OBJ: 13.4.3 Relate gene regulation to development in multicellular organisms.
STA: UT.BIO.2.1.b | UT.BIO.2.3.a TOP: Foundation Edition
BLM: analysis

90. ANS:
External forces (such as a drying pond) trigger internal factors (such as hormonal changes) that change the rate of metamorphosis.

PTS: 1 DIF: L2 REF: p. 383
OBJ: 13.4.3 Relate gene regulation to development in multicellular organisms.
STA: UT.BIO.2.1.b | UT.BIO.2.3.a TOP: Foundation Edition
BLM: comprehension

OTHER

91. ANS:
Bacterial transformation

PTS: 1 DIF: L2 REF: p. 339
OBJ: 12.2.2 Discuss the experiments leading to the identification of DNA as the molecule that carries the genetic code. STA: UT.BIO.4.3.a | UT.BIO.4.3.e TOP: Foundation Edition
BLM: analysis

92. ANS:
The mice live in experiments 2 and 3.

PTS: 1 DIF: L1 REF: p. 339
OBJ: 12.2.2 Discuss the experiments leading to the identification of DNA as the molecule that carries the genetic code. STA: UT.BIO.4.3.a | UT.BIO.4.3.e TOP: Foundation Edition
BLM: analysis

93. ANS:
The harmless bacteria were transformed by the heat-killed bacteria, making the harmless bacteria deadly. The mice that were injected with the mixture died.

PTS: 1 DIF: L2 REF: p. 339
OBJ: 12.1.1 Summarize the process of bacterial transformation.
STA: UT.BIO.2.1.d TOP: Foundation Edition
BLM: synthesis

94. ANS:
The harmless bacteria would be transformed into disease-causing bacteria. To test this hypothesis, he could inject the bacteria in to mice and see if the mice develop pneumonia, or he could grow them on plates and observe the colonies that grow.

PTS: 1 DIF: L3 REF: p. 338 | p. 339
OBJ: 12.1.1 Summarize the process of bacterial transformation.
STA: UT.BIO.2.1.d BLM: evaluation

95. ANS:
The bacterial cell membrane can somehow permit very large molecules like DNA to enter the cell.

PTS: 1 DIF: L3 REF: p. 338| p. 339
OBJ: 12.1.1 Summarize the process of bacterial transformation.
STA: UT.BIO.2.1.d BLM: synthesis

96. ANS:
adenine, thymine, guanine, and cytosine

PTS: 1 DIF: L1 REF: p. 345
OBJ: 12.2.3 Describe the steps leading to the development of the double-helix model of DNA.
STA: UT.BIO.4.3.a | UT.BIO.4.3.e TOP: Foundation Edition

97. ANS:
32.9 percent

PTS: 1 DIF: L1 REF: p. 345
OBJ: 12.2.3 Describe the steps leading to the development of the double-helix model of DNA.
STA: UT.BIO.4.3.a | UT.BIO.4.3.e TOP: Foundation Edition
BLM: application

98. ANS:
27.4 percent

PTS: 1 DIF: L3 REF: p. 345
OBJ: 12.2.3 Describe the steps leading to the development of the double-helix model of DNA.
STA: UT.BIO.4.3.a | UT.BIO.4.3.e BLM: analysis

99. ANS:
The values would both fall.

PTS: 1 DIF: L3 REF: p. 345
OBJ: 12.2.3 Describe the steps leading to the development of the double-helix model of DNA.
STA: UT.BIO.4.3.a | UT.BIO.4.3.e BLM: evaluation

100. ANS:
Yes if A is high, C will be low. Adenine pairs with thymine. So, there will be as much thymine as there is adenine. Together, A and T make up about 62 percent of the bases. That means only 38 percent of the bases can be a combination of G and C. So, G and C are each only about 19 percent of the total.

PTS: 1 DIF: L2 REF: p. 345
OBJ: 12.2.3 Describe the steps leading to the development of the double-helix model of DNA.
STA: UT.BIO.4.3.a | UT.BIO.4.3.e BLM: analysis

101. ANS:
The experiments were done by Hershey and Chase, and they confirmed that DNA was the genetic material found in genes.

PTS: 1 DIF: L2 REF: p. 341
OBJ: 12.2.2 Discuss the experiments leading to the identification of DNA as the molecule that carries the genetic code. STA: UT.BIO.4.3.a | UT.BIO.4.3.e TOP: Foundation Edition
BLM: comprehension

102. ANS:
The DNA was labeled with ^{32}P, and the protein was labeled with ^{35}S. The two labels can be distinguished in the lab.

PTS: 1 DIF: L2 REF: p. 341
OBJ: 12.2.2 Discuss the experiments leading to the identification of DNA as the molecule that carries the genetic code. STA: UT.BIO.4.3.a | UT.BIO.4.3.e TOP: Foundation Edition
BLM: analysis

103. ANS:
They would have found that the bacteria contained ^{35}S.

PTS: 1 DIF: L1 REF: p. 341
OBJ: 12.2.2 Discuss the experiments leading to the identification of DNA as the molecule that carries the genetic code. STA: UT.BIO.4.3.a | UT.BIO.4.3.e TOP: Foundation Edition
BLM: application

104. ANS:
No, the DNA did not have to function and make new bacteria for Hershey and Chase to draw their conclusion. The DNA was radioactively labeled, so they could detect it inside the bacteria, even if the DNA did not function.

PTS: 1 DIF: L3 REF: p. 341
OBJ: 12.2.2 Discuss the experiments leading to the identification of DNA as the molecule that carries the genetic code. STA: UT.BIO.4.3.a | UT.BIO.4.3.e BLM: analysis

105. ANS:
These experiments confirm the result that Avery found: that genes are made of DNA. The conclusion is made much stronger because it is reached through two very different sets of experiments.

PTS: 1 DIF: L3 REF: p. 341
OBJ: 12.2.2 Discuss the experiments leading to the identification of DNA as the molecule that carries the genetic code. STA: UT.BIO.4.3.a | UT.BIO.4.3.e BLM: evaluation

106. ANS:
Structure D is made from structure A, which is one of the strands of DNA.

PTS: 1 DIF: L2 REF: p. 368 | p. 369
OBJ: 13.1.2 Explain the process of transcription. STA: UT.BIO.4.3.c
TOP: Foundation Edition BLM: application

107. ANS:
Structure F is a codon that specifies the amino acid alanine.

PTS: 1 DIF: L2 REF: p. 368 | p. 369
OBJ: 13.2.1 Identify the genetic code and explain how it is read.
STA: UT.BIO.4.3.a TOP: Foundation Edition
BLM: analysis

108. ANS:
Structure E is the start codon, which specifies the amino acid methionine.

PTS: 1 DIF: L3 REF: p. 368 | p. 369
OBJ: 13.2.1 Identify the genetic code and explain how it is read.
STA: UT.BIO.4.3.a BLM: synthesis

109. ANS:
The base sequence of the codon (structure F) would change from GCU to GUG.

PTS: 1 DIF: L3 REF: p. 367 | p. 368 | p. 369
OBJ: 13.3.1 Define mutations and describe the different types of mutations.
STA: UT.BIO.4.3.d BLM: synthesis

110. ANS:
The deletion of structure C would shift the reading frame of the codons during translation. As a result, the sequence of the amino acids that follows after structure C might change.

PTS: 1 DIF: L3 REF: p. 373
OBJ: 13.3.1 Define mutations and describe the different types of mutations.
STA: UT.BIO.4.3.d BLM: synthesis

111. ANS:
Translation (or protein synthesis) is illustrated.

PTS: 1 DIF: L2 REF: p. 368 | p. 369
OBJ: 13.2.2 Summarize the process of translation. STA: UT.BIO.4.3.c
TOP: Foundation Edition BLM: knowledge

112. ANS:
Structure C is a ribosome.

PTS: 1 DIF: L2 REF: p. 368 | p. 369
OBJ: 13.2.2 Summarize the process of translation. STA: UT.BIO.4.3.c
TOP: Foundation Edition BLM: comprehension

113. ANS:
Structure F is a codon.

PTS: 1 DIF: L2 REF: p. 367 | p. 368 | p. 369
OBJ: 13.2.2 Summarize the process of translation. STA: UT.BIO.4.3.c
TOP: Foundation Edition BLM: comprehension

114. ANS:
The codons and anticodons have complementary nitrogenous bases, allowing them to base pair. Because the kind of amino acid attached to a tRNA depends on the tRNA's anticodon, the base pairing between the anticodons and codons brings a specific sequence of amino acids to the ribosomes. For example, the codon labeled F is complementary to the anticodon UAC and codes for the amino acid methionine.

PTS: 1 DIF: L3 REF: p. 367 | p. 368 | p. 369
OBJ: 13.2.2 Summarize the process of translation. STA: UT.BIO.4.3.c
BLM: evaluation

115. ANS:
The bond between the methionine and its tRNA will be broken. The tRNA will move away from the ribosome, allowing it to bind with another methionine. The ribosome will move down the mRNA to the next codon.

PTS: 1 DIF: L2 REF: p. 368 | p. 369

OBJ: 13.2.2 Summarize the process of translation. STA: UT.BIO.4.3.c
BLM: application

116. ANS:
A chromosomal mutation results from processes A, B, C, and D.

PTS: 1 DIF: L1 REF: p. 374
OBJ: 13.3.1 Define mutations and describe the different types of mutations.
STA: UT.BIO.4.3.d TOP: Foundation Edition
BLM: knowledge

117. ANS:
Process D involves two chromosomes.

PTS: 1 DIF: L2 REF: p. 374
OBJ: 13.3.1 Define mutations and describe the different types of mutations.
STA: UT.BIO.4.3.d TOP: Foundation Edition
BLM: application

118. ANS:
Process A results in the deletion of a segment of a chromosome. Process B results in the duplication of a segment of a chromosome.

PTS: 1 DIF: L2 REF: p. 374
OBJ: 13.3.1 Define mutations and describe the different types of mutations.
STA: UT.BIO.4.3.d BLM: analysis

119. ANS:
A segment of a chromosome becomes oriented in the reverse direction during process C.

PTS: 1 DIF: L2 REF: p. 374
OBJ: 13.3.1 Define mutations and describe the different types of mutations.
STA: UT.BIO.4.3.d TOP: Foundation Edition
BLM: analysis

120. ANS:
Process D is a translocation.

PTS: 1 DIF: L2 REF: p. 374
OBJ: 13.3.1 Define mutations and describe the different types of mutations.
STA: UT.BIO.4.3.d TOP: Foundation Edition
BLM: comprehension

ESSAY

121. ANS:
Griffith killed disease-causing bacteria and mixed them with live, harmless bacteria. The harmless bacteria transformed into disease-causing bacteria. Because the ability to cause disease was an inherited by the offspring of the transformed bacteria, Griffith concluded that the transforming factor had to be a gene.

PTS: 1 DIF: L2 REF: p. 339
OBJ: 12.1.1 Summarize the process of bacterial transformation.
STA: UT.BIO.2.1.d TOP: Foundation Edition
BLM: comprehension

122. ANS:

A bacteriophage has just two parts: the protein coat and the nucleic acid. So, Hershey and Chase needed to label just two parts to find out which part was responsible for transmitting the genetic code. Avery had to run many experiments in which he destroyed various kinds of biological chemicals, one at a time, to see which chemical was responsible for transmitting genetic information.

PTS: 1 DIF: L3 REF: p. 340 | p. 341
OBJ: 12.1.2 Describe the role of bacteriophages in identifying genetic material.
STA: UT.BIO.4.3.b | UT.BIO.4.3.e BLM: evaluation

123. ANS:
The three roles of DNA in heredity are storing information, copying information, and transmitting information. If a mistake is made in storing information, an existing cell might not be able to make all the materials it needs to function as a cell. If a mistake is made copying DNA, then a new cell would have a faulty code and might not have all the information needed to function as a cell. If a mistake is made in making the cells that transmit information to the next generation, then the offspring might not get all the information it needs to function as an organism.

PTS: 1 DIF: L3 REF: p. 342 | p. 343
OBJ: 12.1.3 Identify the role of DNA in heredity. STA: UT.BIO.4.3.b | UT.BIO.4.3.c
BLM: evaluation

124. ANS:
DNA has three functions: to store, copy, and transmit information. DNA is like a book, because books also have those functions. They hold information until the information is needed. The information in the books can be copied, and each copy of the book has the same information as the original book.

PTS: 1 DIF: L2 REF: p. 342| p. 343
OBJ: 12.1.3 Identify the role of DNA in heredity. STA: UT.BIO.4.3.b | UT.BIO.4.3.c
TOP: Foundation Edition BLM: comprehension

125. ANS:
Each nucleotide is made of three parts: a phosphate group, deoxyribose, and a base. Covalent bonds between the phosphate and the deoxyribose molecules gives DNA stability. There are two long bases (adenine and guanine), and two short bases (thymine and cytosine). There is always a long base and a short base in each pair: adenine always pairs with thymine, and guanine always pairs with cytosine. Because a long and a short base are always together, the backbones of the DNA molecule can be parallel and uniform and hydrogen bonds can form between the base pairs. This hydrogen bond is easily broken so DNA can "unzip" for replication, and the individual strands stay securely intact.

PTS: 1 DIF: L3 REF: p. 344 | p. 345 | p. 348
OBJ: 12.2.1 Identify the chemical components of DNA. STA: UT.BIO.4.3.a
BLM: synthesis

126. ANS:
Hershey and Chase grew bacteriophages in cultures containing radioactive isotopes of ^{32}P and ^{35}S. The ^{32}P became incorporated into the bacteriophage's DNA, because DNA contains phosphorus. The ^{35}S became incorporated into the bacteriophage's protein coat, because proteins contain sulfur. After the bacteriophages were allowed to infect bacteria, Hershey and Chase found that nearly all the radioactivity in the bacteria was from ^{32}P. This indicated that the bacteriophage's DNA was injected into the bacteria. The results were important because they showed that the bacteriophage's genetic material was DNA, not protein.

PTS: 1 DIF: L2 REF: p. 341
OBJ: 12.2.2 Discuss the experiments leading to the identification of DNA as the molecule that carries the genetic code. STA: UT.BIO.4.3.a | UT.BIO.4.3.e TOP: Foundation Edition

BLM: application

127. ANS:
A DNA molecule has the shape of a double helix, or that of a twisted ladder. Each strand of the helix is a chain of nucleotides. The two strands are held together by hydrogen bonds between the nitrogenous bases of the nucleotides on opposite strands. The nitrogenous bases form hydrogen bonds with one another in pairs. Adenine forms hydrogen bonds with thymine, and guanine forms hydrogen bonds with cytosine.

PTS: 1 DIF: L2 REF: p. 344 | p. 345 | p. 346 | p. 347 | p. 348
OBJ: 12.2.3 Describe the steps leading to the development of the double-helix model of DNA.
STA: UT.BIO.4.3.a | UT.BIO.4.3.e TOP: Foundation Edition
BLM: application

128. ANS:
The chromosome would first unravel into supercoiled strands of nucleosomes, which would unravel into looser coils. Then, the coils would unravel into strands of nucleosomes. The nucleosomes would unravel into clusters of histones and a single DNA molecule.

PTS: 1 DIF: L3 REF: p. 352
OBJ: 12.3.1 Summarize the events of DNA replication. STA: UT.BIO.4.3.b
BLM: application

129. ANS:
In both prokaryotes and eukaryotes, DNA replication begins with the breaking of the hydrogen bonds between the DNA's base pairs, causing the two DNA strands to separate and unwind. Each strand serves as a template for the attachment of complementary bases, forming a new strand of DNA. As a result, two identical DNA molecules are formed, each with one original strand of DNA and one new strand of DNA. In most prokaryotes, however, DNA replication begins at a single point on the chromosome and often proceeds in two directions. In the larger chromosomes of eukaryotes, DNA replication begins at hundreds of points on the chromosomes and proceeds in two directions.

PTS: 1 DIF: L3 REF: p. 352 | p. 353
OBJ: 12.3.2 Compare DNA replication in prokaryotes with that of eukaryotes
STA: UT.BIO.4.3.b TOP: Foundation Edition
BLM: synthesis

130. ANS:
Often, the two chromosomes in a prokaryotic cell attach to different points inside the cell membrane and are separated when the cell splits to form two new cells. In eukaryotic cells, the chromosomes separate from each other during anaphase of mitosis.

PTS: 1 DIF: L2 REF: p. 353
OBJ: 12.3.2 Compare DNA replication in prokaryotes with that of eukaryotes
STA: UT.BIO.4.3.b BLM: synthesis

131. ANS:
Messenger RNA carries copies of instructions for assembling proteins from DNA to the ribosomes. Ribosomal RNA is a component of the ribosomes. Transfer RNA carries amino acids to the ribosomes for assembly into proteins.

PTS: 1 DIF: L2 REF: p. 363 OBJ: 13.1.1 Contrast RNA and DNA.
STA: UT.BIO.4.3.a TOP: Foundation Edition
BLM: application

132. ANS:

Accept any four of the following answers: RNA polymerase is involved in transcription, whereas DNA polymerase is involved in DNA replication. During transcription, free nucleotides base pair with the nucleotides on only one strand of a DNA molecule, not both strands as in DNA replication. In transcription, the free nucleotides are RNA nucleotides, not DNA nucleotides. Transcription continues until a stop signal is reached on the DNA strand. DNA replication continues until the entire chromosome is replicated. At the end of transcription, one single-stranded RNA molecule is formed, not two double-stranded DNA molecules. The newly formed RNA molecule leaves the nucleus, whereas the newly formed DNA molecules stay in the nucleus.

PTS: 1 DIF: L3 REF: p. 364 | p. 365
OBJ: 13.1.2 Explain the process of transcription. STA: UT.BIO.4.3.c
BLM: evaluation

133. ANS:
After being transcribed from DNA, the pre-mRNA molecule is reduced in size by having nonexpressed sequences, called introns, cut out from it. The remaining expressed sequences, called exons, are then spliced together. Next, a cap and a tail are added to the opposite ends of the mRNA molecule, forming the final mRNA molecule.

PTS: 1 DIF: L2 REF: p. 365
OBJ: 13.1.2 Explain the process of transcription. STA: UT.BIO.4.3.c
BLM: application

134. ANS:
Most amino acids can be specified by more than one codon. This can help neutralize the effect of some substitution mutations. If a substitution mutation results in a new codon that specifies the same amino acid, the mutation will have no effect. For example, if a substitution mutation occurs in a "CUG," codon, and a U is substituted for the C, the resulting codon, "UUG," still codes for the amino acid *Leu*. In fact, if another substitution mutation happens and "UUG," is changed to "UUA," the codon would still specify *Leu.*

PTS: 1 DIF: L3 REF: p. 367 | p. 373
OBJ: 13.2.1 Identify the genetic code and explain how it is read.
STA: UT.BIO.4.3.a BLM: evaluation

135. ANS:
After a molecule of mRNA is transcribed in the nucleus it moves to the cytoplasm. A ribosome then positions itself at the start codon on the mRNA molecule. As each successive codon passes the ribosome, a molecule of tRNA brings an amino acid to the ribosome. Only a tRNA molecule with an anticodon that is complementary to the codon on the mRNA can attach an amino acid to the growing polypeptide chain. The ribosome attaches each new amino acid to the chain, and the bond holding the tRNA to the amino acid is broken. The ribosome moves to the next codon, and the process repeats until the entire mRNA molecule is translated.

PTS: 1 DIF: L2 REF: p. 368 | p. 369
OBJ: 13.2.2 Summarize the process of translation. STA: UT.BIO.4.3.c
TOP: Foundation Edition BLM: comprehension

136. ANS:
Point mutations include substitutions, insertions, and deletions of single nucleotides in DNA. Insertions and deletions have a greater effect on proteins than do substitutions, because insertions and deletions can affect every amino acid that is specified by the nucleotides that follow the point of mutation. In contrast, a substitution affects a single amino acid. A change in more than one amino acid is more likely to alter the ability of the protein to function normally than is a change in a single amino acid.

PTS: 1 DIF: L2 REF: p. 373
OBJ: 13.3.1 Define mutations and describe the different types of mutations.
STA: UT.BIO.4.3.d TOP: Foundation Edition
BLM: analysis

137. ANS:
When pesticides are present, mosquitoes that have a mutation that allows them to be resistant to pesticides have an advantage over mosquitoes without that mutation. In an area being sprayed with pesticide, mosquitoes lacking the mutation would die, and the resistant mosquitoes would live. So, having the mutation is beneficial to the mosquitoes.

PTS: 1 DIF: L3 REF: p. 375 | p. 376
OBJ: 13.3.2 Describe the effects mutations can have on genes. STA: UT.BIO.4.3.d
BLM: evaluation

138. ANS:
The *lac* repressor might be unable to bind with the operator. As a result, RNA polymerase would not be prevented from beginning the process of transcription, and the *lac* genes would be turned on permanently. Another effect of the mutation might be that the *lac* repressor would be unable to bind with lactose. As a result, the repressor would permanently bind with the operator, RNA polymerase would be prevented from binding to the promoter, and the *lac* genes would be turned off permanently.

PTS: 1 DIF: L3 REF: p. 377 | p. 378
OBJ: 13.4.1 Describe gene regulation in prokaryotes. STA: UT.BIO.2.1.b
BLM: evaluation

139. ANS:
Eukaryotic cells use DNA-binding proteins to regulate gene expression. The proteins bind to specific sites, called enhancer sequences, near the gene. Some of the proteins activate the transcription of the gene when they bind to the DNA. Others inhibit the transcription of the gene.

Eukaryotic cells also use RNA interference to block gene expression. A Dicer enzyme cuts a small loop of miRNA into tiny pieces. Then, the pieces bind with proteins to make a silencing complex. When the complex finds a piece of mRNA that has a code that matches its own code, it sticks to the mRNA and shuts it down.

PTS: 1 DIF: L3 REF: p. 379 | p. 380
OBJ: 13.4.2 Explain how most eukaryotic genes are regulated. STA: UT.BIO.2.1.b
BLM: synthesis

140. ANS:
Every cell that has a nucleus in a multicellular organism has all the genes to build that organism. But not every cell needs every gene, so it is important that the unneeded genes are switched off. For example, nerve tissue needs to be flexible, not stiff and rigid. So, the genes that code for the proteins that create the rigidity of bones would be inappropriate in nerves. Genes that create bone structure need to be turned off in nerve cells.

PTS: 1 DIF: L2 REF: p. 379 | p. 380
OBJ: 13.4.3 Relate gene regulation to development in multicellular organisms.
STA: UT.BIO.2.1.b | UT.BIO.2.3.a TOP: Foundation Edition
BLM: evaluation