MOLECULAR BIOLOGY

MULTIPLE CHOICE QUESTIONS

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Molecular biology

UNIT I

1. Which scientist(s) confirmed that DNA is the genetic material using the bacteriophage experiment?
a) James Watson and Francis Crick
b) Alfred Hershey and Martha Chase
c) Erwin Chargaff
d) Rosalind Franklin
Answer: b) Alfred Hershey and Martha Chase

2. What is the primary function of DNA in cells?
a) Energy production b) Protein synthesis
c) Cell division d) Waste elimination
Answer: b) Protein synthesis

3. What is the structure of DNA?
a) Single-stranded helix b) Double-stranded helix
c) Triple-stranded helix d) Quadruple-stranded helix
Answer: b) Double-stranded helix

4. Which nitrogenous bases pair together in DNA?
a) Adenine-Thymine; Cytosine-Guanine
b) Adenine-Cytosine; Thymine-Guanine
c) Adenine-Guanine; Cytosine-Thymine
d) Adenine-Uracil; Cytosine-Thymine
Answer: a) Adenine-Thymine; Cytosine-Guanine

5. What holds the two strands of DNA together?
a) Hydrogen bonds between phosphate groups
b) Covalent bonds between nitrogenous bases

c) Phosphodiester bonds between sugar molecules
d) Hydrogen bonds between complementary nitrogenous bases

Answer: d) Hydrogen bonds between complementary nitrogenous bases

6. The process of copying DNA into RNA is known as:
a) Replication b) Translation
c) Transcription d) Transformation
Answer: c) Transcription

7. In eukaryotic cells, where is DNA primarily located?
a) Nucleus b) Cytoplasm
c) Mitochondria d) Endoplasmic reticulum
Answer: a) Nucleus

8. Which enzyme is responsible for unwinding the DNA double helix during replication?
a) DNA ligase b) DNA polymerase
c) Helicase d) RNA polymerase
Answer: c) Helicase

9. What does the "Central Dogma" of molecular biology describe?
a) The process of DNA replication
b) The flow of genetic information from DNA to RNA to protein
c) The structure of DNA
d) The function of enzymes in DNA repair
Answer: b) The flow of genetic information from DNA to RNA to protein

10. What did the Hershey-Chase experiment confirm?
a) DNA is the genetic material in bacteria
b) RNA is the genetic material in bacteria

c) Proteins are the genetic material in bacteria
d) Lipids are the genetic material in bacteria
Answer: a) DNA is the genetic material in bacteria

11. Which of the following is true about RNA?
a) It is a double-stranded molecule
b) It contains thymine nucleotides
c) It is usually single-stranded
d) It is confined to the nucleus only
Answer: c) It is usually single-stranded

12. The genetic information in RNA is stored in the sequence of its:
a) Deoxyribose sugars b) Nitrogenous bases
c) Phosphodiester bonds d) Hydrogen bonds
Answer: b) Nitrogenous bases

13. Which enzyme is responsible for synthesizing RNA from a DNA template?
a) DNA polymerase b) RNA polymerase
c) Helicase d) Ligase
Answer: d) RNA polymerase

14. What is the function of MRNA in the cell?
a) It carries amino acids during protein synthesis
b) It acts as a catalyst in biochemical reactions
c) It carries genetic information from DNA to ribosomes
d) It stabilizes the structure of ribosomes
Answer: C) It carries genetic information from DNA to \ ribosomes

15. Which type of RNA brings amino acids to the ribosome during protein synthesis?
a) MRNA b) RRNA
c) TRNA d) SNRNA
Answer: c) TRNA

16. Which RNA molecule is a structural component of ribosomes?
a) MRNA b) RRNA
c) TRNA d) SIRNA
Answer: b) RRNA

17. Which RNA molecule is involved in the regulation of gene expression by interfering with mRNA?
a) MRNA b) RRNA
c) TRNA d) SIRNA
Answer: d) SIRNA

18. The process of converting RNA into proteins is called:
a) Transcription b) Translation
c) Replication d) Transformation
Answer: b) Translation

19. In eukaryotic cells, where does RNA processing (capping, splicing, and polyadenylation) occur?
a) Nucleus b) Ribosome
c) Cytoplasm d) Mitochondria
Answer: a) Nucleus

20. Which RNA molecule carries out the catalytic activity in some RNA molecules?
a) MRNA b) TRNA
c) TRNA d) Ribozyme
Answer: d) Ribozyme

21. The RNA molecule that carries genetic information for the synthesis of proteins is:
a) MRNA b) TRNA
c) RRNA d) SNRNA
Answer: a) MRNA

22. RNA viruses replicate using which enzyme?
a) DNA polymerase b) RNA polymerase
c) Reverse transcriptase d) Ligase
Answer: c) Reverse transcriptase

23. Which RNA type is involved in the regulation of alternative splicing?
a) MRNA b) TRNA
c) TRNA d) SNRNA
Answer: d) SNRNA

24. Which of the following is not a type of RNA?
a) HNRNA b) MIRNA
c) SIDNA d) PIRNA
Answer: c) SIDNA

25. Which RNA type is involved in the transport of proteins across the nuclear membrane?
a) MRNA b) RRNA
c) TRNA d) SNRNA
Answer: a) MRNA

26. The RNA molecule involved in the synthesis of ribosomal RNA is abbreviated as:
a) MRNA b) RRNA
c) TRNA d) SNORNA
Answer: d) SNORNA

27. Which RNA type is associated with gene silencing and regulation of gene expression?
a) SIRNA b) RRNA
c) TRNA d) MRNA
Answer: a) SIRNA

28. Which RNA molecule is responsible for recognizing the start codon during translation?
a) MRNA b) TRNA
c) TRNA d) SNRNA
Answer: c) TRNA

29. The process by which a pre-mRNA is modified and matures into a functional mRNA is called:
a) Transcription b) Translation
c) RNA splicing d) RNA editing
Answer: c) RNA splicing

30. RNA viruses are known for their high mutation rates primarily due to:
a) DNA proofreading mechanisms
b) High fidelity of RNA polymerase
c) Lack of RNA polymerase
d) Lack of proofreading mechanisms
Answer: d) Lack of proofreading mechanisms

31. Which RNA molecule carries out the synthesis of proteins in the cytoplasm?
a) MRNA b) RRNA
c) TRNA d) SNRNA
Answer: a) MRNA

32. The RNA molecule that acts as an adapter molecule during protein synthesis is:
a) MRNA b) RRNA
c) TRNA d) SIRNA
Answer: c) TRNA

33. Which RNA type is involved in the removal of introns from pre-mRNA?
a) MRNA b) RRNA

c) TRNA d) SNRNA
Answer: d) SNRNA

34. RNA interference (RNAi) involves which type of RNA molecule?
a) SIRNA b) TRNA
c) TRNA d) MRNA
Answer: a) SIRNA

35. The enzyme responsible for adding a modified guanine nucleotide to the 5' end of mRNA is:
a) Helicase b) Ligase
c) RNA polymerase d) Guanyl transferase
Answer: d) Guanyl transferase

36. Which RNA type is involved in the recognition and removal of incorrectly paired nucleotides during DNA replication?
a) MRNA b) TRNA
c) TRNA d) SNRNA
Answer: d) SNRNA

37. Which RNA type is involved in the transport of newly synthesized proteins to the endoplasmic reticulum?
a) MRNA b) TRNA
c) TRNA d) SNRNA
Answer: a) MRNA

38. Which RNA molecule helps in the initiation of translation by binding to the small ribosomal subunit?
a) MRNA b) RRNA
c) TRNA d) SNRNA
Answer: a) MRNA

39. RNA molecules are synthesized through the process of:

a) Translation b) Transcription
c) Replication d) Reverse transcription
Answer: b) Transcription

40. What does DNA stand for?
a) Deoxyribonucleic acid
b) Ribonucleic acid
c) Deoxyribose nucleotide assembly
d) Ribose nucleotide assembly
Answer: a) Deoxyribonucleic acid

41. Which nitrogenous base is not found in DNA?
a) Adenine b) Thymine
c) Cytosine d) Uracil
Answer: d) Uracil

42. The RNA molecule that acts as an adapter molecule during protein synthesis is:
a) MRNA b) RRNA
c) TRNA d) SIRNA
Answer: c) TRNA

43. What type of bond holds together complementary base pairs in DNA?
a) Ionic bond b) Covalent bond
c) Hydrogen bond d) Peptide bond
Answer: c) Hydrogen bond

44. What is the sugar component present in DNA nucleotides?
a) Glucose b) Ribose
c) Deoxyribose d) Sucrose
Answer: c) Deoxyribose

45. The structure of DNA was first described by:
a) Charles Darwin b) James Watson and Francis Crick
c) Gregor Mendel d) Rosalind Franklin

Answer: b) James Watson and Francis Crick

46. Which enzymes are involved in DNA replication?
a) Ligase and helicase b) Helicase and polymerase
c) Polymerase and ligase d) Primase and helicase
Answer: b) Helicase and polymerase

47. How many hydrogen bonds are between adenine and thymine in DNA?
a) One b) Two
c) Three d) Four
Answer: b) Two

48. Which of the following is a purine base in DNA?
a) Adenine b) Thymine
c) Cytosine d) Uracil
Answer: a) Adenine

49. The backbone of the DNA double helix is made up of:
a) Sugars and phosphates b) Nitrogenous bases
c) Hydrogen bonds d) Lipids
Answer: a) Sugars and phosphates

50. What is the function of DNA polymerase in DNA replication?
a) Unwinds the DNA helix
b) Joins Okazaki fragments
c) Synthesizes new DNA strands
d) Proofreads DNA sequences
Answer: c) Synthesizes new DNA strands

51. What are the building blocks of DNA?
a) Nucleotides b) Amino Acids
c) Monosaccharides d) Fatty Acids
Answer: A) Nucleotides

52. Which nitrogenous base is not found in DNA?
a) Adenine b) Thymine
c) Uracil d) Cytosine
Answer: c) Uracil

53. The structure of DNA was proposed by:
a) Rosalind Franklin b) James Watson and Francis Crick
c) Linus Pauling d) Maurice Wilkins
Answer: b) James Watson and Francis Crick

54. Which bond type holds the two strands of DNA together?
a) Ionic Bonds b) Covalent Bonds
c) Hydrogen Bonds d) Metallic Bonds
Answer: c) Hydrogen Bonds

55. What is the function of DNA polymerase in DNA replication?
a) Unwinds the DNA double helix
b) Synthesizes new DNA strands
c) Proofreads and repairs DNA
d) Initiates DNA replication
Answer: b) Synthesizes new DNA strands

56. The backbone of DNA is made up of:
a) Sugars and Phosphate groups b) Nitrogenous bases
c) Hydrogen bonds d) Amino acids
Answer: a) Sugars and Phosphate groups

57. Which enzyme is responsible for breaking hydrogen bonds between DNA strands during replication and transcription?
a) Ligase b) Helicase
c) Polymerase d) Primase
Answer: b) Helicase

58. In DNA, the complementary base pairing is between:
a) Adenine and Thymine b) Adenine and Guanine
c) Thymine and Cytosine d) Cytosine and Guanine
Answer: a) Adenine and Thymine

59. What is the function of RNA primase in DNA replication?
a) Adds RNA nucleotides to the DNA strand
b) Synthesizes a short RNA primer for DNA replication
c) Connects Okazaki fragments
d) Seals nicks in the sugar-phosphate backbone
Answer: b) Synthesizes a short RNA primer for DNA replication

60. What does the term "semi-conservative replication" mean in the context of DNA replication?
a) One strand of the DNA is newly synthesized, while the other is the original template strand
b) Both strands of DNA are completely synthesized anew
c) DNA replication occurs in a conservative manner, preserving the original DNA molecule
d) DNA replication happens in a random manner, creating variations in the DNA structure
Answer: a) One strand of the DNA is newly synthesized, while the other is the original template strand

61. What are the building blocks of DNA?
a) Amino acids b) Nucleotides
c) Proteins d) Lipids
Answer: b) Nucleotides

62. Which nitrogenous bases pair together in DNA?
a) Adenine - Guanine; Thymine - Cytosine
b) Adenine - Cytosine; Thymine - Guanine
c) Adenine - Thymine; Cytosine - Guanine

d) Adenine - Uracil; Thymine - Cytosine
Answer: c) Adenine - Thymine; Cytosine - Guanine

63. What type of bond holds the two strands of DNA together?
a) Hydrogen bond b) Ionic bond
c) Covalent bond d) Peptide bond
Answer: a) Hydrogen bond

64. The backbone of the DNA molecule is composed of:
a) Sugar and phosphate b) Nitrogenous bases
c) Hydrogen bonds d) Adenine and Thymine
Answer: a) Sugar and phosphate

65. What is the shape of the DNA molecule?
a) Linear b) Circular
c) Helical d) Cubic
Answer: c) Helical

66. Who discovered the structure of the DNA molecule?
a) Albert Einstein b) James Watson and Francis Crick
c) Charles Darwin d) Gregor Mendel
Answer: b) James Watson and Francis Crick

67. Which enzyme is responsible for unwinding the DNA helix during replication?
a) DNA polymerase b) Helicase
c) RNA polymerase b) Ligase
Answer: b) Helicase

68. How many hydrogen bonds are between adenine and thymine in DNA?
a) One b) Two
c) Three d) Four
Answer: b) Two

69. What is the full form of DNA?
a) Deoxyribonucleic acid
b) Diatomic nitrogenous acid
c) Dimerized nucleotide assembly
d) Deoxyribose nucleotide arrangement
Answer: a) Deoxyribonucleic acid

70. The sugar present in DNA is:
a) Glucose b) Fructose
c) Ribose d) Deoxyribose
Answer: d) Deoxyribose

71. What is the primary role of DNA topoisomerases in DNA structure?
a) DNA replication
b) DNA repair
c) Regulation of DNA supercoiling
d) Formation of nucleosomes
Answer: c) Regulation of DNA supercoiling

72. Which type of DNA topoisomerase is involved in the removal of positive supercoils ahead of the replication fork?
a) Type I b) Type II
c) Type III d) Type IV
Answer: a) Type I

73. Topoisomerase II inhibitors, like etoposide, primarily target:
a) DNA helicase b) RNA polymerase
c) Topoisomerase II d) DNA ligase
Answer: c) Topoisomerase II

74. Which enzyme helps in the relaxation of negative supercoils in DNA?

a) DNA polymerase b) DNA helicase
c) DNA gyrase d) DNA ligase
Answer: c) DNA gyrase

75. Which of the following topoisomerases introduces both single-strand breaks in DNA?
a) Type I b) Type II
c) Type III d) Type IV
Answer: b) Type II

76. Which type of DNA topoisomerase requires ATP hydrolysis for its activity?
a) Type I b) Type II
c) Type III d) Type IV
Answer: b) Type II

77. DNA supercoiling helps in:
a) Making DNA replication faster
b) Increasing the stability of DNA
c) Facilitating transcription and replication
d) Protecting DNA from mutations
Answer: c) Facilitating transcription and replication

78. Which type of DNA topology involves the intertwining of two DNA molecules?
a) Positive supercoiling b) Negative supercoiling
c) Catenation d) Decatenation
Answer: c) Catenation

79. The writhe of DNA refers to its:
a) Twist b) Coiling
c) Overall shape d) Tertiary structure
Answer: c) Overall shape

80. Which DNA topoisomerase is the target of quinolone antibiotics like ciprofloxacin?

a) Type I b) Type II
c) Type II d) Type IV
Answer: b) Type II

81. What is the sugar molecule found in RNA?
a) Ribose b) Deoxyribose
c) Glucose d) Fructose
Answer: a) Ribose

82. Which nitrogenous base is not found in RNA?
a) Adenine a) Cytosine
c) Thymine d) Uracil
Answer: c) Thymine

83. What type of bond holds together the complementary bases in an RNA molecule?
a) Ionic bond b) Hydrogen bond
c) Covalent bond d) Peptide bond
Answer: d) Hydrogen bond

84. What is the primary function of tRNA (transfer RNA)?
a) Protein synthesis b) Carbohydrate metabolism
c) Energy production d) DNA replication
Answer: a) Protein synthesis

85. Which part of the RNA molecule carries the genetic code from the DNA to the ribosome?
a) MRNA (messenger RNA)
b) TRNA (ribosomal RNA)
c) TRNA (transfer RNA)
d) SNRNA (small nuclear RNA)
Answer a) MRNA (messenger RNA)

91. What is the approximate length of a typical tRNA molecule?
a) 50-70 nucleotides b) 100-120 nucleotides

c) 200-250 nucleotides d) 300-350 nucleotides
Answer: a) 50-70 nucleotides

92. Which of the following regions of tRNA contains the anticodon?
a) Tertiary structure b) D arm
c) Anticodon loop d) Acceptor stem
Answer: c) Anticodon loop

93. Which base is not typically found in the anticodon loop of TRNA?
a) Adenine (A) b) Cytosine (C)
c) Uracil (U) d) Thymine (T)
Answer: d) Thymine (T)

94. The acceptor stem of tRNA is crucial for:
a) Binding to MRNA
b) Recognition by ribosomes
c) Attachment of amino acids
d) Formation of hydrogen bonds
Answer: c) Attachment of amino acids

95. Which enzyme is responsible for attaching amino acids to TRNA molecules?
a) DNA polymerase b) RNA polymerase
c) Ligase d) Aminoacyl-TRNA synthetase
Answer: d) Aminoacyl-TRNA synthetase

96. The secondary structure of TRNA is primarily formed due to:
a) Hydrogen bonds b) Phosphodiester bonds
c) Peptide bonds d) Covalent bonds
Answer: a) Hydrogen bonds

97. The D arm of TRNA contains:

a) The anticodon loop
b) The amino acid attachment site
c) A dihydrouridine (D) loop
d) loop
Answer: c) A dihydrouridine (D) loop

98. What is the role of the TΨC loop in TRNA?
a) Recognition by ribosomes b) Attachment of amino acids
c) Stability of TRNA structure d) Formation of peptide bonds
Answer: c) Stability of TRNA structure

99. The anticodon of TRNA is complementary to:
a) DNA sequence b) MRNA codon
c) RRNA sequence d) Amino acid sequence
Answer: b) MRNA codon

100. The tertiary structure of TRNA is crucial for its function in:
a) Transcription b) Translation
c) DNA replication d) RNA splicing
Answer: b) Translation

101. What is the shape of most bacterial chromosomes?
a) Linear b) Circular
c) Helical d) Triangular
Answer: b) Circular

102. Where is the bacterial chromo some typically located?
a) Nucleus b) Cytoplasm
c) Mitochondria d) Nucleoid
Answer: d) Nucleoid

103. What material primarily constitutes a bacterial chromosome?
a) DNA only b) RNA only

c) DNA and RNA d) DNA and proteins
Answer: b) DNA and proteins

104. Which enzyme is responsible for supercoiling bacterial DNA?
a) Helicase b) DNA polymerase
c) Topoisomerase d) Ligase
Answer: c) Topoisomerase

105. What are the proteins that help in DNA packaging in bacterial chromosomes called?
a) Histones b) Tubulins
c) Chromatids d) Nucleosomes
Answer: a) Histones

106. How many origin(s) of replication does a typical bacterial chromosome have?
a) One b) Two
c) Three d) Four
Answer: a) One

107. Which of the following is responsible for segregating bacterial chromosomes during cell division?
a) Centrosome b) Spindle fibers
c) FTSZ protein d) Centromere
Answer: c) FTSZ protein

108. What is the function of the DNA protein in bacterial chromosome replication?
a) Initiating replication b) DNA repair
c) Packaging DNA d) Transcription
Answer: a) Initiating replication

109. Which process ensures genetic diversity in bacteria by the exchange of genetic material between two cells?

a) Transformation b) Conjugation
c) Transduction d) Replication
Answer: b) Conjugation

110. What is the role of the DNA gyrase enzyme in bacterial chromosome replication?
a) Separating DNA strands b) Proofreading DNA
c) Unwinding DNA d) Repairing DNA breaks
Answer: c) Unwinding DNA

111. Which part of the bacterial chromosome codes for essential cellular functions?
a) Non-coding regions b) Introns
c) Exons d) Genes
Answer: d) Genes

112. What is the function of the HU protein in bacterial chromosomes?
a) DNA replication b) DNA supercoiling
c) DNA repair d) DNA packaging
Answer: b) DNA supercoiling

113. Which bacterial cell division process is akin to cytokinesis in eukaryotic cells?
a) Binary fission b) Conjugation
c) Transformation d) Transduction
Answer: a) Binary fission

114. Which phase of the bacterial growth curve shows a rapid increase in cell division?
a) Lag phase b) Log phase
c) Stationary phase d) Death phase
Answer: b) Log phase

115. In bacterial replication, what is the role of the Okazaki fragments?
a) Initiating replication b) Proofreading DNA
c) Synthesizing leading stran d) Synthesizing lagging strand
Answer: d) Synthesizing lagging strand

116. Which enzyme seals the nicks between adjacent DNA segments in bacterial replication?
a) DNA polymerase III b) DNA ligase
c) DNA polymerase I d) RNA polymerase
Answer: b) DNA ligase

117. What is the purpose of the oric site in bacterial replication?
a) Initiating replication b) Packaging DNA
c) Repairing DNA d) Transcription initiation
Answer: a) Initiating replication

118. Which phase of bacterial growth involves a period of cellular adjustment and preparation for growth?
a) Log phase b) Lag phase
c) Stationary phase d) Death phase
Answer: b) Lag phase

119. Which of the following is NOT a component of a bacterial nucleoid?
a) DNA gyrase b) Histones
c) DNA-binding proteins d) Ribosomes
Answer: d) Ribosomes

120. Which process involves the uptake of free DNA from the environment by bacteria?
a) Conjugation b) Transformation
c) Transduction d) Transcription
Answer: b) Transformation

121. What term is used for a circular DNA molecule that exists independently of the bacterial chromosome?
a) Plasmid b) Chromatid
c) Ribosome d) Codon
Answer: a) Plasmid

122. Which enzyme proofreads the newly synthesized DNA during bacterial replication?
a) DNA ligase b) DNA polymerase III
c) DNA polymerase I d) Primase
Answer: b) DNA polymerase III

123. Which phase of bacterial growth shows a balance between cell division and cell death?
a) Log phase b) Lag phase
c) Stationary phase d) Death phase
Answer: c) Stationary phase

124. What is the function of the replisome in bacterial replication?
a) DNA unwinding b) DNA supercoiling
c) DNA synthesis d) DNA proofreading
Answer: C) DNA synthesis

125. Which protein aids in separating DNA strands during bacterial replication by breaking hydrogen bonds?
a) Helicase b) Topoisomerase
c) Primase d) Ligase
Answer: a) Helicase

126. Which of the following is true about the organization of genes in prokaryotes?
a) Genes are organized into chromosomes
b) Genes are organized into a nucleus

c) Genes are organized in circular DNA molecules
d) Genes are organized in linear DNA molecules
Answer: c) Genes are organized in circular DNA molecule

127. What is the region in prokaryotic DNA where replication begins?
a) Telomere b) Origin of replication
c) Centromere d) Promoter region
Answer: b) Origin of replication

128. Which enzyme is responsible for unwinding the DNA helix during replication in prokaryotes?
a) DNA polymerase b) Helicase
c) RNA polymerase d) Ligase
Answer: b) Helicase

129. What are the small, circular DNA molecules often found in prokaryotes apart from the main chromosome?
a) Plasmids b) Centromeres
c) Nucleoid d) Telomeres
Answer: a) Plasmids

130. The genetic material of most prokaryotes is composed of:
a) Multiple chromosomes
b) A single circular chromosome
c) Linear chromosomes
d) DNA packed in a nucleus
Answer: b) A single circular chromosome

131. Which sequence signals the end of transcription in prokaryotic genes?
a) Stop codon b) Terminator sequence
c) Start codon d) Promoter sequence
Answer: b) Terminator sequence

132. What is the primary function of the Shine-Dalgarno sequence in prokaryotic gene expression?
a) Initiation of translation
b) Termination of translation
c) Enhancing transcription
d) RNA stability
Answer: a) Initiation of translation

133. The lac operon in E. coli is an example of:
a) An inducible operon b) A repressible operon
c) A constitutive operon d) A non-functional operon
Answer: a) An inducible operon

134. Which enzyme is responsible for adding nucleotides to the growing mRNA chain during transcription in prokaryotes?
a) DNA polymerase b) RNA polymerase
c) Helicase d) Ligase
Answer: b) RNA polymerase

135. In prokaryotes, what is the function of the operator region in an operon?
a) Initiates transcription
b) Binds with RNA polymerase
c) Controls access of RNA polymerase to genes
d) Terminates translation
Answer: c) Controls access of RNA polymerase to genes

136. Which of the following is true about the polycistronic nature of prokaryotic mRNA?
a) Contains multiple ribosomal binding sites
b) Codes for a single protein
c) Codes for multiple proteins
d) Lacks a Shine-Dalgarno sequence
Answer: c) Codes for multiple proteins

137. The process of turning off the expression of a group of genes in prokaryotes is known as:
a) Induction b) Repression
c) Activation d) Transcription
Answer: b) Repression

138. The process of transferring genetic material between prokaryotic cells through direct cell-to-cell contact is called:
a) Transformation b) Transduction
c) Conjugation d) Replication
Answer: c) Conjugation

139. Which protein in prokaryotes is responsible for preventing the reassociation of separated DNA strands during replication?
a) DNA polymerase
b) Single-strand binding protein (SSB)
c) DNA ligase
d) Helicase
Answer: b) Single-strand binding protein (SSB)

140. Which structural genes in the lac operon encode enzymes involved in lactose metabolism?
a) IACZ and lacy b) IACA and IACB
c) IACZ and IACA d) IACY and IACB
Answer: a) IACZ and IACY

141. The lac operon is negatively regulated by which protein?
a) Lac repressor
b) CAP (catabolite activator protein)
c) RNA polymerase
d) Helicase
Answer: a) Lac repressor

142. The process of transduction in prokaryotes involves the transfer of genetic material by:
a) Direct cell-to-cell contact b) Bacterial conjugation
c) Viral vectors d) Transformation
Answer: c) Viral vectors

143. The site where RNA polymerase initially binds to begin transcription is called the:
a) Promoter b) Operator
c) Enhancer d) Terminator
Answer: a) Promoter

144. Which enzyme is responsible for sealing nicks or gaps between DNA fragments during DNA replication?
a) DNA polymerase b) Helicase
c) DNA ligase d) RNA polymerase
Answer: c) DNA ligase

145. The TRP operon in bacteria is an example of:
a) An inducible operon b) A repressible operon
c) A constitutive operon d) An activator operon
Answer: b) A repressible operon

146. The function of the sigma factor in prokaryotic transcription is to:
a) Initiate translation
b) Bind to the promoter region of DNA
c) Terminate transcription
d) Enhance mRNA stability
Answer: b) Bind to the promoter region of DNA

147. In prokaryotic gene regulation, the repressor protein binds to the:
a) Promoter b) Operator
c) Enhancer d) Terminator

Answer: b) Operator

148. The process where a piece of naked DNA is taken up by a bacterial cell and incorporated into its genome is called:
a) Transformation b) Transduction
c) Conjugation d) Replication
Answer: a) Transformation

149. Which enzyme proofreads and corrects errors in newly synthesized DNA during replication in prokaryotes?
a) DNA polymerase b) Helicase
c) DNA ligase d) DNA gyrase
Answer: a) DNA polymerase

150. Which of the following is not a component of the lac operon?
a) Promoter b) Operator
c) Repressor d) Enhancer
Answer: d) Enhancer

151. What is the primary function of DNA Gyrase in bacterial cells?
a) DNA replication b) DNA repair
c) DNA supercoiling d) DNA transcription
Answer: c) DNA supercoiling

152. Which type of enzyme is DNA Gyrase?
a) Polymerase b) Helicase
c) Topoisomerase d) Ligase
Answer: c) Topoisomerase

153. Inhibitors of DNA Gyrase are effective against which type of pathogens?
a) Fungi b) Viruses
c) Bacteria d) Protists

Answer: c) Bacteria

154. Which class of antibiotics targets DNA Gyrase?
a) Penicillins b) Cephalosporins
c) Tetracyclines d) Fluoroquinolones
Answer: d) Fluoroquinolones

155. What is the specific role of DNA Gyrase during DNA replication?
a) Unwinds the DNA helix
b) Seals nicks in DNA strands
c) Introduces positive supercoils
d) Relaxes negative supercoils
Answer: D) Relaxes negative supercoils

156. Which bacterial DNA Gyrase subunit is the primary target of many antibiotics?
a) A subunit b) B subunit
c) C subunit d) D subunit
Answer: a) A subunit

157. In bacterial cells, DNA Gyrase is involved in which of the following processes?
a) Repair of damaged DNA
b) Regulation of gene expression
c) Chromosomal segregation
d) Control of cell division
Answer: c) Chromosomal segregation

158. What is the consequence of inhibiting DNA Gyrase activity in bacteria?
a) Replication fork stabilization
b) Prevention of DNA unwinding
c) DNA fragmentation
d) Accumulation of positive supercoils

Answer: b) Prevention of DNA unwinding

159. Which type of DNA Gyrase inhibition leads to the bactericidal effect of certain antibiotics?
a) Inhibition of DNA supercoiling
b) Inhibition of DNA relaxation
c) Inhibition of DNA replication
d) Inhibition of DNA unwinding
Answer: C) Inhibition of DNA replication

160. Mutations in DNA Gyrase can lead to bacterial resistance against which class of antibiotics?
a) Aminoglycosides b) Macrolides
c) Quinolones d) Sulfonamides
Answer: c) Quinolones

UNIT II

1. Which of the following is not a function of DNA Polymerase?
a) Proofreading b) Repairing damaged DNA
c) Initiating DNA replication d) Transcription of RNA
Answer: d) Transcription of RNA

2. Which type of DNA Polymerase is primarily involved in replication of the leading strand during DNA replication in E. coli?
a) DNA Polymerase I b) DNA Polymerase II
c) DNA Polymerase III d) DNA Polymerase IV
Answer: c) DNA Polymerase III

3. The process of adding nucleotides to the growing DNA strand occurs in which direction?
a) 3' to 5' b) 5' to 3'
c) Bidirectional d) Random
Answer: b) 5' to 3'

4. Which DNA Polymerase is responsible for replacing RNA primers with DNA nucleotides during DNA replication?
a) DNA Polymerase I b) DNA Polymerase II
c) DNA Polymerase III d) DNA Polymerase IV
Answer: a) DNA Polymerase I

5. DNA Polymerase III possesses which exonuclease activity?

a) 3' to 5' exonuclease
b) 5' to 3' exonuclease
c) Both 3' to 5' and 5' to 3' exonuclease
d) No exonuclease activity
Answer: a) 3' to 5' exonuclease

6. Which DNA Polymerase is involved in DNA repair mechanisms, particularly in response to DNA damage?
a) DNA Polymerase I b) DNA Polymerase II
c) DNA Polymerase III d) DNA Polymerase IV
Answer: d) DNA Polymerase IV

7. Which of the following is a high-fidelity DNA Polymerase commonly used in PCR (Polymerase Chain Reaction)?
a) Taq Polymerase b) DNA Polymerase I
c) DNA Polymerase III d) DNA Polymerase IV
Answer: a) Taq Polymerase

8. The proofreading activity of DNA Polymerase helps in reducing the error rate during DNA replication. Which domain is primarily responsible for this proofreading function?
a) 5' to 3' polymerase domain
b) 3' to 5' exonuclease domain
c) 5' to 3' exonuclease domain
d) C-terminal domain
Answer: c) 5' to 3' exonuclease domain

9. DNA Polymerase requires which molecule as a primer to initiate DNA synthesis?
a) RNA b) DNA
c) Proteins d) Lipids
Answer: a) RNA

10. Which of the following is a critical cofactor for the function of DNA Polymerase?
a) ATP b) Mg2+
c) NAD+ d) Coenzyme A
Answer: b) Mg2+

11. Which DNA Polymerase is known for its ability to tolerate and replicate through damaged DNA templates?
a) DNA Polymerase I b) DNA Polymerase II
c) DNA Polymerase III d) DNA Polymerase IV
Answer: b) DNA Polymerase II

12. Which type of DNA Polymerase is involved in the final step of DNA replication, ensuring that all gaps are filled?
a) DNA Polymerase I b) DNA Polymerase II
c) DNA Polymerase III d) DNA Polymerase IV
Answer: a) DNA Polymerase I

13. The fidelity of DNA replication by DNA Polymerase is mainly due to:
a) High processivity b) Low processivity
c) Proofreading activity d) Lack of exonuclease activity
Answer: c) Proofreading activity

14. In which cellular compartment is DNA Polymerase typically found in eukaryotic cells?
a) Nuclear b) Cytoplasm
c) Mitochondre d) Endoplasmic reticulum
Answer: a) Nucleus

15. Which DNA Polymerase is responsible for synthesizing the lagging strand during DNA replication in E. coli?
a) DNA Polymerase I b) DNA Polymerase II
c) DNA Polymerase III d) DNA Polymerase IV
Answer: a) DNA Polymerase I

16. Which DNA Polymerase has a role in base excision repair mechanisms?
a) DNA Polymerase I b) DNA Polymerase II
c) DNA Polymerase III d) DNA Polymerase IV
Answer: a) DNA Polymerase I
17. DNA Polymerase III holoenzyme consists of:
a) Core enzyme only
b) Core enzyme and primase
c) Core enzyme and sliding clamp
d) Core enzyme, sliding clamp, and clamp loader
Answer: d) Core enzyme, sliding clamp, and clamp loader

18. Which DNA Polymerase is responsible for replicating damaged DNA when the replication machinery encounters lesions?
a) DNA Polymerase I b) DNA Polymerase II
c) DNA Polymerase III d) DNA Polymerase IV
Answer: d) DNA Polymerase IV

19. Which DNA Polymerase is known for its processivity and high speed of replication?
a) DNA Polymerase I b) DNA Polymerase II
c) DNA Polymerase III d) DNA Polymerase IV
Answer: c) DNA Polymerase III

20. DNA Polymerase adds nucleotides by catalyzing the formation of which bond?
a) Phosphodiester bond b) Hydrogen bond
c) Glycosidic bond d) Peptide bond
Answer: a) Phosphodiester bond

21. Which DNA Polymerase is essential for removing RNA primers and replacing them with DNA during DNA replication?

a) DNA Polymerase I b) DNA Polymerase II
c) DNA Polymerase III d) DNA Polymerase IV
Answer: a) DNA Polymerase I

22. Which exonuclease activity of DNA Polymerase is responsible for removing mismatched bases?
a) 3' to 5' exonuclease
b) 5' to 3' exonuclease
c) Both 3' to 5' and 5' to 3' exonuclease
d) No exonuclease activity
Answer: b) 5' to 3' exonuclease

23. Which DNA Polymerase is temperature resistant and commonly used in PCR due to its stability?
a) DNA Polymerase I b) DNA Polymerase II
c) DNA Polymerase III d) Taq Polymerase
Answer: d) Taq Polymerase

24. Which enzyme is primarily responsible for unwinding the DNA double helix during replication?
a) DNA polymeras b) Helicase
c) Ligase d) Primase
Answer: a) Helicase

25. What is the function of DNA polymerase during replication?
a) Unwinds the DNA strands
b) Joins Okazaki fragments
c) Adds nucleotides to the growing DNA strand
d) Proofreads and repairs mistakes in DNA
Answer: c) Adds nucleotides to the growing DNA strand

26. Which of the following is a characteristic of the leading strand during DNA replication?
a) Synthesized discontinuously

b) Requires multiple RNA primers
c) Synthesized in the 3' to 5' direction
d) Synthesized continuously
Answer: d) Synthesized continuously

27. Which enzyme is responsible for creating RNA primers needed for DNA replication?
a) DNA ligase b) DNA polymerase III
c) Helicase d) Primase
Answer: d) Primase

28. The replication fork is formed by the action of:
a) Topoisomerase
b) Single-strand binding proteins
c) DNA helicase
d) All of the above
Answer: d) All of the above

29. Which of the following accurately describes the function of DNA ligase?
a) It unwinds the double helix.
b) It joins Okazaki fragments.
c) It synthesizes RNA primers.
d) It proofreads the newly synthesized DNA.
Answer: b) It joins Okazaki fragments.

30. Which direction does DNA polymerase read the template strand during replication?
a) 3' to 5' b) 5' to 3'
c) Bidirectionally d) None of the above
Answer: b) 5' to 3'

31. The Okazaki fragments are synthesized on the lagging strand in the direction:
a) 5' to 3' b) 3' to 5'

c) Bidirectionally d) None of the above
Answer: a) 5' to 3'

32. Which enzyme is responsible for relieving the tension in the DNA molecule ahead of the replication fork?
a) DNA polymerase b) Topoisomerase
c) Helicase d) Ligase
Answer: b) Topoisomerase

33. During DNA replication, the newly synthesized strand is formed in which direction?
a) 3' to 5' b) 5' to 3'
c) Both 3' to 5' and 5' to 3' d) None of the above
Answer: b) 5' to 3

34. DNA polymerases are responsible for:
a) Adding RNA primers
b) Synthesizing new DNA strands
c) Breaking down DNA strands
d) Repairing damaged DNA
Answer: B) Synthesizing new DNA strands

35. Which DNA polymerase is responsible for the majority of DNA synthesis during replication in E. coli?
a) DNA polymerase I b) DNA polymerase II
c) DNA polymerase III d) DNA polymerase IV
Answer: c) DNA polymerase III

36. The enzyme responsible for unwinding the DNA double helix ahead of the replication fork is:
a) DNA ligase b) DNA polymerase
c) Helicase d) Topoisomerase
Answer: c) Helicase

37. Which enzyme seals the nicks between the adjacent DNA fragments to create a continuous DNA strand during replication?
a) DNA helicase b) DNA ligase
c) DNA polymerase III d) Primase
Answer: b) DNA ligase

38. The enzyme responsible for adding RNA primers on the DNA template strand is:
a) DNA ligase b) DNA polymerase III
c) DNA polymerase I d) Primase
Answer: d) Primase

39. Which enzyme proofreads the newly synthesized DNA strand to correct any errors in base pairing?
a) DNA ligase b) DNA polymerase I
c) DNA polymerase III d) Exonuclease
Answer: d) Exonuclease

40. DNA polymerases require a primer to initiate DNA synthesis because they:
a) Cannot recognize the template strand without a primer
b) Need the primer as a substrate to attach nucleotides
c) Require RNA to initiate the process
d) Cannot function without the primer's guidance
Answer: b) Need the primer as a substrate to attach nucleotides

41. Which enzyme is responsible for relieving the torsional strain in the DNA helix during replication?
a) DNA ligase b) DNA polymerase
c) Helicase d) Topoisomerase
Answer: d) Topoisomerase

42. The enzyme responsible for removing RNA primers and replacing them with DNA nucleotides is:
a) DNA ligase b) DNA polymerase I
c) DNA polymerase III d) Primase
Answer: b) DNA polymerase I

43. Which enzyme synthesizes short RNA sequences complementary to the DNA template strand?
a) DNA ligase b) DNA polymerase I
c) DNA polymerase III d) Primase
Answer: d) Primase

44. The enzyme that functions to stabilize unwound DNA strands during replication is called:
a) Topoisomerase
b) DNA ligase
c) SSB (Single-Stranded Binding) proteins
d) DNA polymerase III
Answer: c) SSB (Single-Stranded Binding) proteins

45. Which enzyme removes the RNA primers during DNA replication and fills the gaps with DNA nucleotides?
a) DNA ligase b) DNA polymerase I
c) DNA polymerase III d) Primase
Answer: b) DNA polymerase I

46. The enzyme that adds deoxyribonucleotides to the 3' end of the growing DNA chain during replication is:
a) DNA ligase b) DNA polymerase I
c) DNA polymerase III d) Primase
Answer: c) DNA polymerase III

47. Which enzyme joins the Okazaki fragments during DNA replication?
a) DNA ligase b) DNA polymerase I

c) DNA polymerase III d) Primase
Answer: a) DNA ligase

48. DNA polymerase III has which of the following proofreading activities?
a) 3' to 5' exonuclease
b) 5' to 3' exonuclease
c) Both 3' to 5' and 5' to 3' exonucleases
d) It lacks proofreading activity
Answer: a) 3' to 5' exonuclease

49. The enzyme responsible for removing supercoiling ahead of the replication fork is:
a) DNA ligase b) DNA polymerase
c) Helicase d) Topoisomerase
Answer: d) Topoisomerase

50. The enzyme that recognizes and cuts damaged or incorrect DNA sequences during replication is called:
a) DNA ligase b) DNA polymerase
c) Endonuclease d) Primase
Answer: c) Endonuclease

51. Which enzyme synthesizes the RNA primers necessary for DNA replication?
a) DNA ligase b) DNA polymerase I
c) DNA polymerase III d) Primase
Answer: d) Primase

52. Which enzyme is responsible for resealing the nicked DNA strands after removal of RNA primers?
a) DNA ligase b) DNA polymerase I
c) DNA polymerase III d) Primase
Answer: a) DNA ligase

53. The enzyme responsible for initiating the synthesis of a new DNA strand is:
a) DNA ligase b) DNA polymerase I
c) DNA polymerase III d) Primase
Answer: d) Primase

54. The enzyme responsible for proofreading the newly synthesized DNA and excising the incorrect nucleotides is:
a) DNA ligase b) DNA polymerase I
c) DNA polymerase III d) Exonuclease
Answer: d) Exonuclease

55. Which enzyme seals the gaps between the Okazaki fragments during DNA replication?
a) DNA ligase b) DNA polymerase I
c) DNA polymerase III d) Primase
Answer: a) DNA ligase

56. The enzyme that forms a phosphodiester bond between adjacent DNA fragments is called:
a) DNA ligase b) DNA polymerase
c) Helicase d) Topoisomerase
Answer: a) DNA ligase

57. Which enzyme breaks hydrogen bonds between the DNA strands during replication?
a) DNA ligase b) DNA polymerase
c) Helicase d) Topoisomerse
Answer: c) Helicase

58. The enzyme responsible for nick translation, replacing RNA with DNA in the lagging strand, is:
a) DNA ligase b) DNA polymerase I
c) DNA polymerase III d) Primase
Answer: b) DNA polymerase I

59. What is the primary characteristic of theta replication in DNA?
a) Unidirectional replication
b) Bidirectional replication
c) Replication without errors
d) Replication in prokaryotes only
Answer: b) Bidirectional replication

60. Which enzyme is responsible for unwinding the DNA double helix during theta replication?
a) DNA ligase b) DNA polymerase
c) DNA helicase d) DNA primase
Answer: c) DNA helicasewi

61. In theta replication, what is the structure formed that resembles the Greek letter "theta"?
a) Replication fork b) Okazaki fragments
c) RNA primer d) DNA polymerase III
Answer: a) Replication fork

62. What initiates the process of theta replication?
a) RNA primer b) DNA polymerase III
c) DNA helicase d) Origin of replication
Answer: d) Origin of replication

63. Which organisms commonly exhibit theta replication?
a) Prokaryotes b) Eukaryotes
c) Archaea d) Both a) and c)
Answer: d) Both a) and c)

64. What is the function of DNA primase in theta replication?
a) Synthesizing RNA primers
b) Proofreading DNA
c) Linking Okazaki fragments

d) Sealing nicks in DNA
Answer: a) Synthesizing RNA primers

65. Which strand of DNA is synthesized continuously during theta replication?
a) Leading strand b) Lagging strand
c) Template strand d) Primer strand
Answer: a) Leading strand

66. What is the role of DNA ligase in theta replication?
a) Unwinding the DNA double helix
b) Forming phosphodiester bonds between DNA fragments
c) Synthesizing new DNA strands
d) Initiating replication
Answer: b) Forming phosphodiester bonds between DNA fragments

67. Which phase of the cell cycle does theta replication occur in?
a) G1 phase b) S phase
c) G2 d) M phase
Answer: b) S phase

68. What is the consequence if there is a mistake in the process of theta replication?
a) Mutation in the DNA sequence
b) Activation of DNA ligase
c) Initiation of apoptosis
d) Activation of DNA helicase
Answer: a) Mutation in the DNA sequence

69. What type of DNA replication mechanism involves the formation of a rolling circle intermediate?
a) Semi-conservative replication
b) Dispersive replication

c) Rolling circle replication
d) Conservative replication
Answer: c) Rolling circle replication

70. Which enzyme is primarily responsible for initiating rolling circle replication in certain viruses and plasmids?
a) DNA polymerase III b) DNA ligase
c) Helicase d) Initiator endonuclease
Answer: d) Initiator endonuclease

71. In the rolling circle model, which strand acts as the template for continuous synthesis?
a) Leading strand b) Lagging strand
c) Both strands d) None of the strands
Answer: a) Leading strand

72. What is the initial step in the rolling circle model of replication?
a) Nicking of DNA
b) Formation of replication bubble
c) Primer synthesis
d) Unwinding of DNA
Answer: a) Nicking of DNA

73. Which of the following is a characteristic feature of rolling circle replication?
a) Bidirectional synthesis
b) Formation of Okazaki fragments
c) Continuous synthesis on both strands
d) Formation of concatemers
Answer: c) Continuous synthesis on both strands

74. Which type of genetic material commonly utilizes the rolling circle mechanism for replication?
a) Double-stranded DNA b) Single-stranded DNA

c) RNA d) Circular DNA
Answer: d) Circular DNA

75. Which DNA polymerase is involved in elongating the leading strand during rolling circle replication?
a) DNA polymerase I b) DNA polymerase II
c) DNA polymerase III d) DNA polymerase IV
Answer: c) DNA polymerase III

76. What is the purpose of the rolling circle replication in certain viruses and plasmids?
a) To repair damaged DNA
b) To synthesize RNA
c) To produce multiple copies of circular DNA
d) To degrade cellular DNA
Answer: c) To produce multiple copies of circular DNA

77. Which step follows the synthesis of the first strand in rolling circle replication?
a) Ligation of Okazaki fragments
b) Synthesis of the lagging strand
c) Replication fork regression
d) Removal of RNA primers
Answer: b) Synthesis of the lagging strand

78. Which structural component allows the continuous synthesis of DNA in rolling circle replication?
a) RNA primase b) RNA polymerase
c) DNA ligase d) RNA primer
Answer: d) RNA primer

UNIT III

1. Which enzyme is responsible for transcribing DNA into RNA?
a) DNA polymerase b) RNA polymerase
c) Helicase d) Ligase
Answer: b) RNA polymrase

2. In eukaryotic cells, where does transcription take place?
a) Nucleus b) Cytoplasm
c) Endoplasmic reticulum d) Mitochondria
Answer: a) Nucleus

3. Which of the following is not a type of RNA involved in transcription?
a) MRNA b) RRNA
c) TRNA d) DNA
Answer: a) DNA

4. The region in DNA where RNA polymerase binds to initiate transcription is called the:
c) Exon d) Intron
Answer: a) Promoter

5. Which direction is RNA synthesized during transcription?
a) 5' to 3' b) 3' to 5'
c) Bidirectional d) Random
Answer: a) 5' to 3'

6. What is the function of the terminator sequence in transcription?
a) Initiates transcription
b) Terminates transcription
c) Enhances transcription
d) Processes RNA
Answer: b) Terminates transcription

7. Which RNA polymerase is responsible for transcribing most protein-coding genes in eukaryotes?
a) RNA polymerase I b) RNA polymerase II
c) RNA polymerase III d) RNA polymerase IV
Answer: b) RNA polymerase II

8. Which molecule provides the energy for the formation of phosphodiester bonds in the growing RNA chain?
a) ATP b) GTP
c) CTP d) UTP
Answer: d) UTP

9. In prokaryotes, what is the role of sigma factor in transcription?
a) Termination of transcription
b) Elongation of RNA
c) Initiation of transcription
d) Proofreading of RNA
Answer: c) Initiation of transcription

10. Which process involves the removal of introns and joining of exons in pre-mRNA?
a) Splicing b) Capping
c) Polyadenylation d) Editing
Answer: a) Splicing

11. The genetic code is read in units of:

a) 1 nucleotide b) 2 nucleotides
c) 3 nucleotides d) 4 nucleotides
Answer: c) 3 nucleotides

12. What is the function of the 5' cap added to mRNA during transcription?
a) Protects MRNA from degradation
b) Enhances translation
c) Aids in splicing
d) Determines mRNA stability
Answer: a) Protects mRNA from degradation

13. Which enzyme cataIyzes the addition of poly (A) tail to MRNA?
a) DNA polymerase b) RNA polymerase I
c) Poly(A) polymerase d) RNA ASE
Answer: c) Poly (A) polymerase

14. Which type of RNA carries amino acids to the ribosome during translation?
a) MRNA b) RRNA
c) TRNA d) SNRNA
Answer: c) TRNA

15. Which of the following is a start codon in MRNA?
a) AUG b) UAG
c) UAA d) UGA
Answer: a) AUG

16. The site on a tRNA molecule that recognizes the mRNA codon is called the:
a) Anticodon b) Amino acid attachment site
c) Promoter d) Codon
Answer: a) Anticodon

17. What is the function of RNA polymerase III in eukaryotic cells?
a) Synthesizes MRNA b) Synthesizes TRNA
c) Synthesizes TRNA d) Synthesizes MIRNA
Answer: c) Synthesizes TRNA

18. What is the role of transcription factors in gene expression?
a) Initiate translation
b) Initiate transcription
c) Enhance RNA stability
d) Regulate the expression of genes
Answer: d) Regulate the expression of genes

19. Which of the following statements about RNA processing is correct?
a) Occurs in the cytoplasm
b) Involves the addition of introns
c) Leads to the formation of mature MRNA
d) Only occurs in prokaryotic cells
Answer: c) Leads to the formation of mature MRNA

20. The process of transcription occurs in how many phases?
a) One b) Two
c) Three d) Four
Answer: b) Two

21. In eukaryotes, what is the role of the polyadenylation signal in mRNA processing?
a) Initiates translation
b) Adds a poly (A) tail to the MRNA
c) Marks the start codon
d) Initiates transcription
Answer: b) Adds a poly (A) tail to the mRNA

22. Which type of RNA is the most abundant in a cell?
a) MRNA b) RRNA
c) TRNA d) SNRNA
Answer: b) RRNA

23. Which of the following is involved in post-transcriptional gene silencing?
a) MIRNA b) SIRNA
c) PIRNA d) All of the above
Answer: d) All of the above

24. What is the function of the 3' untranslated region (UTR) in mRNA?
a) Determines MRNA stability
b) Initiates translation
c) Protects mRNA from degradation
d) Adds a poly(A) tail
Answer: a) Determines MRNA stability

25. Which enzyme unwinds the DNA double helix during transcription?
a) Helicase b) Topoisomerase
c) Ligase d) Primase
Answer: a) Helicase

26. Which molecule serves as a template for the synthesis of RNA during transcription?
a) MRNA b) TRNA
c) RRNA d) DNA
Answer: d) DNA

27. Which of the following is not a type of RNA polymerase found in eukaryotic cells?
a) RNA polymerase I b) RNA polymerase II
c) RNA polymerase III d) RNA polymerase IV

28. Which of the following is NOT a post-transcriptional modification?
a) Splicing b) Translation
c) Cappine d) Polyadenylation
Answer: b) Translation

29. The addition of a 5' cap to mRNA involves:
a) Addition of a methyIguanosine
b) Addition of a poly-A tail
c) Removal of introns
d) Addition of a phosphate group
Answer: a) Addition of a meth Iguanosine

30. The polyadenylation of mRNA involves the addition of:
a) Adenine nucleotides b) Uracil nucleotides
C) Guanine nucleotides d) Cytosine nucleotides
Answer: a) Adenine nucleotides

31. What is the function of a poly-A tail in MRNA?
a) Protection against degradation
b) Enhancement of transcription
c) Initiation of translation
d) Facilitation of splicing
Answer: a) Protection against degradation

32. Which enzyme is responsible for adding the poly-A tail to MRNA?
a) DNA polymerase b) RNA polymerase I
c) Poly(A) polymerase d) DNA ligase
Answer: c) Poly(A) polymerase

33. Splicing involves the removal of:
a) Exons b) Introns
c) Both exons and introns d) Promoters

Answer: B) Introns

34. What is the spliceosome?
a) An enzyme for polyadenylation
b) An enzyme for capping
c) A complex involved in splicing
d) A complex involved in translation
Answer: c) A complex involved in splicing

35. Which RNA molecule functions in carrying amino acids to the ribosome during translation?
a) MRNA b) TRNA
c) RRNA d) SNRNA
Answer: b) TRNA

36. What is the role of small nuclear RNAs (snRNAs) in post-transcriptional modification?
a) They are involved in mRNA transport
b) They are involved in splicing
c) They act as primers for DNA replication
d) They facilitate translation initiation
Answer: b) They are involved in splicing

37. The removal of introns and joining of exons is carried out by:
a) RNA polymerase b) Ribosomes
c) Spliceosomes d) DNA polymerase
Answer: c) Spliceosomes

38. What is the purpose of alternative splicing?
a) To enhance transcription efficiency
b) To generate multiple protein isoforms from a single gene
c) To prevent mRNA degradation
d) To facilitate RNA transport

Answer: b) To generate multiple protein isoforms from a single gene

39. Which modification protects the 3' end of mRNA from exonuclease degradation?
a) Capping b) Polyadenylation
c) Splicing d) Methylation
Answer: b) Polyadenylation

40. Which of the following is a modification that occurs in TRNA?
a) Capping b) Polyadenylation
c) Intronic splicing d) Addition of amino acids
Answer: d) Addition of amino acids

41. The removal of the 5' cap is crucial for:
a) Translation initiation b) MRNA stability
c) Splicing d) TRNA modification
Answer: a) Translation initiation

42. Which of the following is NOT involved in post-transcriptional modifications?
a) Ribosomes b) RNA polymerase
c) Spliceosomes d) Transfer RNA
Answer: b) RNA polymerase

43. In eukaryotes, the addition of a poly-A tail occurs:
a) After transcription
b) During transcription
c) Before transcription
d) Concurrently with splicing
Answer: a) After transcription

44. Which of these modifications occurs in both prokaryotes and eukaryotes?

a) Polyadenylation b) Capping
c) Splicing d) Ribosome assembly
Answer: a) Polyadenylation

45. The 5' cap is added to:
a) The 5' end of the MRNA
b) The 3' end of the MRNA
c) The middle of the MRNA
d) Both ends of the MRNA
Answer: a) The 5' end of the MRNA

46. Which enzyme is involved in the removal of introns during splicing?
a) RNA polymerase b) DNA ligase
c) Exonuclease d) Spliceosome
Answer: d) Spliceosome

47. What is the significance of RNA editing?
a) Removal of exons from MRNA
b) Addition of exons to pre-MRNA
c) Modification of nucleotides in MRNA
d) Protection of MRNA
Answer: c) Modification of nucleotides in MRNA

48. The addition of a 3' poly-A tail occurs:
a) Before transcription
b) During transcription
c) After transcription
d) Concurrently with splicing
Answer: c) After transcription

49. Which modification protects mRNA from degradation?
A) Alternative splicing B) Polyadenylation
C) RNA editing D) 5' capping
Answer: d) 5' capping

50. The addition of a poly-A tail enhances:
a) MRNA stability b) Splicing efficiency
c) Transcription rate d) Translation initiation
Answer: a) MRNA stability

51. Which of these modifications occurs in the nucleus?
a) 5' capping b) Alternative splicing
c) Polyadenylation d) RNA editing
Answer: b) Alternative splicing

52. Which post-transcriptional modification is specific to eukaryotes?
a) Polyadenylation b) RNA editing
c) Splicing d) Capping
Answer: c) Splicing

53. What is the primary function of the 5' cap in MRNA?
a) Translation initiation
b) Splicing
c) Protecting mRNA from degradation
d) Enhancing transcription
Answer: a) Translation initiation

54. The removal of introns and joining of exons is Catalyzed by:
a) DNA ligase b) RNA polymerase
c) Spliceosome d) Ribosome
Answer: c) Spliceosome

55. Which modification is essential for proper MRNA transport from the nucleus to the cytoplasm?
a) Alternative splicing
b) Polyadenylation
c) 3

d) None

56. The lac operon is found in:
a) Bacteria b) Plants
c) Animals d) Fungi
Answer: a) Bacteria

57. The lac operon is responsible for the metabolism of:
a) Lactose b) Glucose
c) Sucrose d) Fructose
Answer: a) Lactose

58. The lac operon consists of:
a) Operator, promoter, and regulatory gene
b) Promoter, regulator, and terminator
c) Operator, structural genes, and promoter
d) Regulatory gene, terminator, and promoter
Answer: c) Operator, structural genes, and promoter

59. The gene that codes for the lac repressor protein is:
a) LACA b) LACZ
c) LACY d) LACI
Answer: d) LACI

60. The lac repressor protein binds to the operator in the absence of:
a) Glucose b) Lactose
c) ATP d) Allolactose
Answer: b) Lactose

61. The inducer of the lac operon is:
a) Glucose b) Lactose
c) Galactose d) Mannose
Answer: b) Lactose

62. The enzyme responsible for the hydrolysis of lactose is coded by:
a) LACA b) LACZ
c) LACY d) LACI
Answer: b) LACZ

63. Which mutation in the lac operon leads to the production of the lac enzymes continuously, regardless of lactose levels?
a) LACI b) LACOC
c) LACZ d) LACY
Answer: b) LACOC

64. The function of the lac operon's promoter region is to:
a) Bind RNA polymerase
b) Regulate lactose intake
c) Produce the lac repressor
d) Initiate lactose hydrolysis
Answer: a) Bind RNA polymerase

65. The lac operon is an example of:
a) Positive regulation b) Negative regulation
c) Inducible operon d) Repressible operon
Answer: c) Inducible operon

66. Which part of the lac operon controls the access of RNA polymerase to the structural genes?
a) Promoter b) Operator
c) Regulator d) Terminator
Answer: b) Operator

67. In the absence of lactose, the lac repressor protein:
a) Binds to the operator b) Binds to the promoter
c) Inhibits RNA polymerase d) Activates transcription
Answer: a) Binds to the operator

68. Which molecule induces a conformational change in the lac repressor, allowing transcription to occur?
a) Lactose b) Glucose
c) Allolactose d) Galactose
Answer: C) Allolactose

69. The lac operon is switched off when:
a) Lactose is present
b) Glucose is present
c) Lactose and glucose are present
d) Lactose is absent
Answer: b) Glucose is present

70. The lac operon is under the control of:
a) CAP-CAMP complex b) Lac repressor
c) RNA polymerase d) Lactose
Answer: a) CAP-CAMP complex

71. CAP stands for:
a) Cyclic adenosine monophosphate
b) Cyclic adenosine triphosphate
c) Cyclic guanosine monophosphate
d) Cyclic guanosine triphosphate
Answer: a) Cyclic adenosine monophosphate

72. The lac operon exhibits:
a) Positive feedback b) Negative feedback
c) No feedback mechanism d) Bidirectional feedback
Answer: b) Negative feedback

73. Which component of the lac operon is a trans-acting element?
a) Promoter b) Operator
c) Lac repressor d) Regulatory gene
Answer: c) Lac repressor

74. What happens to the lac operon when both glucose and lactose are present?
a) It is turned on
b) It is turned off
c) It is partially turned on
d) It is constitutively expressed
Answer: b) It is turned off

75. In the absence of glucose, the activity of adenylate cyclase:
a) Increases b) Decreases
c) Remains unchanged d) Stops
Answer: a) Increases

76. What role does lactose play in the lac operon?
a) Co-repressor b) Inducer
c) Repressor d) Activator
Answer: b) Inducer

77. The lac operon is an example of:
a) Anabolic pathway b) Catabolic pathway
c) Biosynthetic pathway d) Feedback inhibition
Answer: b) Catabolic pathway

78. The lac operon is negatively regulated because:
a) The lac repressor inhibits transcription
b) The lac repressor activates transcription
c) Lactose inhibits the lac repressor
d) Glucose activates the lac repressor
Answer: a) The lac repressor inhibits transcription

79. The lac operon genes encode proteins involved in:
a) Lactose metabolism b) Glucose metabolism
c) Amino acid synthesis d) DNA replication

Answer: a) Lactose metabolism

80. The lac operon is turned off when glucose is present because:
a) Glucose inhibits the production of CAMP
b) Glucose activates the lac repressor
c) Glucose activates adenylate cyclase
d) Glucose induces lactose synthesis
Answer: a) Glucose inhibits the production of CAMP

81. What is the function of the lac repressor?
a) It activates lactose metabolism
b) It inhibits lactose metabolism
c) It produces lactose
d) It binds to the promoter
Answer: b) It inhibits lactose metabolism

82. The lac operon is transcribed into:
a) MRNA b) TRNA
c) RRNA d) DNA
Answer: a) MRNA

83. In the lac operon, the regulator gene encodes:
a) The lac repressor b) The beta-galactosidase enzyme
a) The permease enzyme d) The transacetylase

84. What is the lac operon?
a) A group of genes involved in lactose metabolism
b) A cellular structure in bacterial cells
c) A regulatory protein in E. coli
d) A type of RNA polymerase
Answer: a) A group of genes involved in lactose metabolism

85. Which organism possesses the lac operon?

a) Yeast b) Bacteria (E. coli)
c) Human cells d) Fungi
Answer: b) Bacteria (E. coli)

86. Who proposed the concept of the lac operon?
a) James Watson b) Francis Crick
c) Jacob and Monod d) Gregor Mendel
Answer: c) Jacob and Monod

87. The lac operon consists of how many structural genes?
a) One b) Two
c) Three d) Four
Answer: b) Two

88. What are the structural genes of the lac operon?
a) LACZ, LACA, LACB
b) LACP, LACQ, LACR
c) LACA, LACR, LACY
d) LACZ, LACY, LACA
Answer: d) LACZ, LACCY, LACA

89. Which gene encodes beta-galactosidase in the lac operon?
a) LACZ b) LACY
c) LACA d) LACR
Answer: a) LACZ

90. Which enzyme in the lac operon is responsible for lactose metabolism?
a) Beta-galactosidase b) Beta-lactamase
c) Lactase d) Galactokinase
Answer: a) Beta-galactosidase

91. Which part of the lac operon acts as the operator site for the lac repressor?
a) Promoter b) LACZ gene

c) LACY gene d) LACO site
Answer: d) LACO site

92. What is the function of the lac repressor?
a) Activates gene expression
b) Inhibits gene expression
c) Initiates DNA replication
d) Repairs DNA damage
Answer: b) Inhibits gene expression

93. Which molecule binds to the lac repressor to release it from the operator site?
a) Lactose b) Glucose
c) RNA polymerase d) Cyclic AMP (cAMP)
Answer: a) Lactose

94. Under which condition does the lac operon get activated?
a) High glucose, low lactose
b) High lactose, low glucose
c) High lactose, high glucose
d) Low lactose, low glucose
Answer: b) High lactose, low glucose

95. Which regulatory molecule is required for cAMP to bind to the lac operon's regulatory region?
a) DNA polymerase b) RNA polymerase
c) Lac repressor d) CAP (catabolite activator protein)
Answer: d) CAP (catabolite activator protein)

96. What is the primary function of the lac operon?
a) Break down lactose into glucose and galactose
b) Synthesize lactose from glucose and galactose
c) Transport lactose into the cell
d) Control the expression of genes involved in lactose metabolism

Answer: d) Control the expression of genes involved in lactose metabolism

97. Which segment of the lac operon contains the promoter sequence?
a) LacZ gene b) LACY gene
c) LACA gene d) Upstream region of the LACZ gene
Answer: d) Upstream region of the LACZ gene

98. What is the role of the catabolite activator protein (CAP) in the lac operon?
a) Binds to the operator site
b) Enhances RNA polymerase binding to the promoter
c) Blocks RNA polymerase from binding
d) Degrades lactose molecules
Answer: b) Enhances RNA polymerase binding to the promoter

99. Which molecule inhibits the activity of the lac repressor?
a) Lactose b) Glucose
c) CAP d) RNA polymerase
Answer: a) Lactose

100. In the absence of lactose, the lac repressor binds to the operator region and:
a) Activates gene expression
b) Inhibits gene expression
c) Promotes cell growth
d) Increases lactose uptake
Answer: b) Inhibits gene expression

101. What happens to the lac operon when glucose is abundant and lactose is absent?
a) It is activated b) It is repressed
c) It becomes hyperactive d) It is unchanged

Answer: b) It is repressed

102. What is the function of the permease encoded by the LACY gene?
a) Cleaves lactose into glucose and galactose
b) Transports lactose into the cell
c) Inhibits the lac repressor
d) Increases CAMP levels
Answer: b) Transports lactose into the cell

103. Which component of the lac operon serves as the binding site for RNA polymerase?
a) Promoter b) Operator
c) LacZ gene d) Lac repressor
Answer: a) Promoter

104. When lactose is present, what happens to the lac repressor?
a) It binds to the operator
b) It binds to the promoter
c) It becomes inactive
d) It enhances CAP activity
Answer: c) It becomes inactive

105. Which gene in the lac operon encodes transacetylase?
a) LacZ b) LACY
c) LACA d) LACR
Answer: c) LACA

106. What is the role of the lacZ gene product in the lac operon?
a) Transport lactose into the cell
b) Convert lactose to allolactose
c) Convert allolactose to glucose and galactose
d) Convert lactose to glucose and galactose

Answer: b) Convert lactose to allolactose

107. In the absence of glucose and lactose, what happens to the lac operon?
a) It is activated b) It is repressed
c) It is in a constitutive state d) It becomes inactive
Answer: b) It is repressed

108. Which molecule directly binds to the lac repressor, causing its release from the operator site?
a) CAMP b) Allolactose
c) CGMP d) None
Answer b) Allolactose

109. Which of the following is a characteristic of spontaneous mutations?
a) They are always caused by external factors
b) They occur randomly without exposure to external agents
c) They exclusively occur in somatic cells
d) They always lead to harmful effects
Answer: b) They occur randomly without exposure to external agents

110. Which type of mutation is most commonly considered spontaneous?
a) Insertion b) Deletion
c) Substitution d) Frameshift
Answer: c) Substitution

111. Which cellular process primarily contributes to spontaneous mutations?
a) DNA replication b) Transcription
c) Translation d) Protein folding
Answer: a) DNA replication

112. Which of the following is an example of a point mutation?
a) Deletion b) Duplication
b) Inversion d) Silent mutation
Answer: d) Silent mutation

113. Spontaneous mutations can occur due to errors in:
a) Repair mechanisms
b) Environmental exposure
c) DNA packaging d) Cell division
Answer: a) Repair mechanisms

114. Which is a consequence of a spontaneous mutation in a germ cell?
a) Somatic cell disorder b) Inherited genetic change
c) Tissue damage d) Cancerous growth
Answer: b) Inherited genetic change

115. What is a common outcome of a frameshift mutation?
a) Silent mutation b) Deletion mutation
c) Reading frame alteration d) Nonsense mutation
Answer: c) Reading frame alteration

116. Spontaneous mutations occur at a rate of approximately:
a) 1 mutation per genome b) 10 mutations per genome
c) 100 mutations per genome d) 1,000 mutations per genome
Answer: c) 100 mutations per genome

117. Which type of mutation causes a change in a single nucleotide?
a) Insertion b) Substitution
c) Deletion d) Inversion
Answer: b) Substitution

118. The process of transversion in DNA mutation involves:

a) Purine to purine substitution
b) Pyrimidine to pyrimidine substitution
c) Purine to pyrimidine substitution
d) Pyrimidine to purine substitution
Answer: c) Purine to pyrimidine substitution

119. Which of the following is an example of a physical mutagen?
a) Ultraviolet (UV) radiation
b) X-rays
c) Benzene
d) Formaldehyde
Answer: a) Ultraviolet (UV) radiation

120. Which chemical mutagen is commonly found in tobacco smoke?
a) Nitrous acid
b) Ethidium bromide
c) polycyclic aromatic hydrocarbons (PAHs)
d) Aflatoxin
Answer: C) Polycyclic aromatic hydrocarbons (PAHs)

121. What is the primary mechanism of action of base analogs as mutagens?
a) They replace nucleotide bases in DNA.
b) They induce breaks in the DNA backbone.
c) They cross-link DNA strands.
d) They cause point mutations.
Answer: a) They replace nucleotide bases in DNA.

122. Which mutagenic agent causes the formation of thymine dimers in DNA?
a) Gamma rays
b) Ethyl methane sulfonate (EMS)
c) Ultraviolet (UV) radiation

d) N-nitroso-N-methylurea (NMU)
Answer: c) Ultraviolet (UV) radiation

123. Which mutagen acts by alkylating DNA bases?
a) EMS b) Ionizing radiation
b) Base analogs d) PAHs
Answer: a) EMS

124. Which mutagen is often used in laboratory settings to induce mutations in organisms?
a) EMS b) UV radiation
c) Ethylene oxide d) Aflatoxin
Answer: a) EMS

125. Which type of mutagenic agent causes single-strand breaks and double-strand breaks in DNA?
a) Alkylating agents
b) Intercalating agents
c) Ionizing radiation
d) Base analogs
Answer: c) Ionizing radiation

126. What is the result of a frameshift mutation?
a) Change in a single nucleotide base
b) Deletion or insertion of nucleotides, altering the reading frcme
c) Substitution of one nucleotide for another
d) Rearrangement of large sections of DNA
Answer: b) Deletion or insertion of nucleotides, altering the reading frame

127. Which mutagenic agent can cause DNA adducts leading to errors in DNA replication?
a) Base analogs b) Alkylating agents
c) Intercalating agents d) Ionizing radiation

Answer: b) Alkylating agents

128. What is the significance of mutagens in evolutionary terms?
a) They always lead to harmful effects on organisms.
b) They accelerate natural selection by introducing genetic diversity.
c) They cause only lethal mutations in organisms.
d) They prevent any genetic variation within a population.
Answer: b) They accelerate natural selection by introducing genetic diversity

129. Which enzyme is responsible for recognizing and repairing mismatched base pairs in DNA?
a) DNA polymerase b) DNA ligase
c) MutS d) Helicase
Answer: c) MutS

130. What is the primary function of mismatch repair?
a) Repairing double-strand breaks
b) Correcting errors in newly synthesized DNA strands
c) Removing damaged nucleotides
d) Unwinding the DNA helix
Answer: b) Correcting errors in newly synthesized DNA strands
Nucleotide Excision Repair

140. In nucleotide excision repair, damaged nucleotides are excised along with how many surrounding nucleotides?
a) 1 b) 6
c) 12 d) 30
Answer: b) 6

141. Which genetic disorder is associated with a defect in nucleotide excision repair?

a) Xeroderma pigmentosum
b) Down syndrome
c) Cystic fibrosis
d) Hemophilia
Answer: a) Xeroderma pigmentosum
Base Excision Repair

142. What type of DNA damage is primarily repaired by base excision repair?
a) Double-strand breaks
b) Bulky lesions
c) Single-base modifications
d) Interstrand crosslinks
Answer: c) Single-base modifications

143. Which enzyme is involved in the removal of damaged bases during base excision repair?
a) DNA polymerase b) DNA ligase
c) DNA glycosylase d) Helicase
Answer: c) DNA glycosylase
Homologous Recombination:

144. Homologous recombination occurs predominantly during which phase of the cell cycle?
a) G1 phase b) S phase
c) G2 phase d) M phase
Answer: b) S phase

145. Which protein mediates the invasion of a homologous DNA strand during homologous recombination?
a) RECA b) DNA polymerase III
c) DNA ligase d) Topoisomerase II
Answer: a) RECA
Non-Homologous End Joining (NHEJ):

146. Which type of DNA damage is primarily repaired by non-homologous end joining?
a) Single-strand breaks
b) Double-strand breaks
c) Bulky lesions
d) Base mismatches
Answer: b) Double-strand breaks

147. Which enzyme is crucial in sealing the broken ends of DNA strands in non-homologous end joining?
a) DNA polymerase b) DNA ligase
c) RECA d) Topoisomerase I
Answer: b) DNA ligase
General DNA Repair

148. Which DNA repair mechanism does not require a template strand for repair?
a) Base excision repair b) Mismatch repair
c) Homologous recombination d) Direct repair
Answer: d) Direct repair

149. Which enzyme is responsible for the removal of alkyl groups from DNA bases in direct repair?
a) DNA polymeras b) DNA ligase
c) DNA photolyase d) Alkyltransferase
Answer: d) Alkyltransferase

150. What is the primary mechanism involved in specialized transduction?
a) Recombination b) Transformation
c) Conjugation d) Transcription
Answer: a) Recombination

151. Which type of genetic material transfer involves a phage vector in specialized transduction?

a) Plasmids
b) Bacterial chromosomes
c) Both plasmids and bacterial chromosomes
d) RNA molecules
Answer: b) Bacterial chromosomes

152. In specialized transduction, which region of the bacterial chromosome is integrated into the phage DNA?
a) Replication origin
b) Selectable marker
c) Attachment site
d) Regulatory gene
Answer: c) Attachment site

153. Which enzyme is involved in the integration of bacterial DNA into the phage genome in specialized transduction?
a) DNA polymerase b) DNA ligase
c) RECA recombinase d) Integrase
Answer: d) Integrase

154. Which phenomenon is responsible for the excision of the hybrid phage DNA in specialized transduction?
a) Excisionase action
b) DNA replication
c) Transposition
d) Recombination
Answer: a) Excisionase action

155. What happens to the bacterial DNA after the phage carrying a portion of it undergoes excision in specialized transduction?
a) It is lost
b) It becomes part of the phage genome
c) It remains in the bacterial chromosome
d) It forms a plasmid

Answer: c) It remains in the bacterial chromosome

156. Which of the following phages is well-known for specialized transduction in E. coli?
a) T2 phage b) Lambda (λ) phage
c) T4 phage d) P1 phage
Answer: b) Lambda (λ) phage

157. What is the outcome when a lysogenic phage undergoes specialized transduction?
a) The host cell survives without any changes
b) The host cell dies
c) The host cell gains new genetic material
d) The host cell becomes immune to other phages
Answer: c) The host cell gains new genetic material

158. Which step distinguishes specialized transduction from generalized transduction?
a) Integration of phage DNA into the host chromosome
b) Packaging of host DNA into phage capsids
c) Excision of phage DNA from the host chromosome
d) Lysis of the host cell
Answer: a) Integration of phage DNA into the host chromosome

159. Specialized transduction primarily occurs during which stage of the phage life cycle?
a) Lytic cycle b) Lysogenic cycle
c) Attachment phase d) Release phase
Answer: b) Lysogenic cycle

160. What is generalized transduction?
a) Transfer of genes between two bacterial cells via a bacteriophage
b) Transfer of any bacterial genes by a bacteriophage

c) Transfer of specific genes within a bacterial cell
d) Transfer of genes from a eukaryotic cell to a prokaryotic cell
Answer: b) Transfer of any bacterial genes by a bacteriophage

161. Which part of the bacteriophage is responsible for generalized transduction?
a) Capsid b) Tail fibers
c) DNA d) Tail sheath
Answer: c) DNA

162. In generalized transduction, which stage of the bacteriophage life cycle involves the accidental packaging of bacterial DNA?
a) Attachment b) Entry
c) Replication d) Assembly
Answer: d) Assembly

163. Which of the following bacterial genes can be transferred via generalized transduction?
a) Only specific genes near the attachment site of the phage
b) Any bacterial genes regardless of their location
c) Only essential genes for bacterial survival
d) Only genes involved in antibiotic resistance
Answer: b) Any bacterial genes regardless of their location

164. What is the primary factor determining the genes transferred during generalized transduction?
a) Specificity of the bacteriophage
b) Size of the bacterial genome
c) Specificity of the bacterial host
d) Random packaging of bacterial DNA
Answer: d) Random packaging of bacterial DNA

165. Which bacterial genetic transfer process involves a viral vector?
a) Conjugation b) Transformation
c) Transduction d) Transcription
Answer: c) Transduction

166. Which of the following bacteriophages are commonly used in studies involving generalized transduction?
a) T2 and T4 b) Lambda and P1
c) M13 and MS2 d) PhiX174 and T7
Answer: a) T2 and T4

167. What happens to the host bacterial cell after generalized transduction?
a) It becomes lysogenic
b) It gets destroyed by the phage
c) It incorporates the new genes into its genome
d) It undergoes binary fission immediately
Answer: c) It incorporates the new genes into its genome

168. How does the bacteriophage mistakenly package bacterial DNA during generalized transduction?
a) Recognition of specific bacterial genes
b) Replication of phage DNA
c) Random chance due to errors in the packaging process
d) Interaction with bacterial ribosomes
Answer: c) Random chance due to errors in the packaging process

169. Which process allows for the incorporation of foreign DNA into a recipient bacterium during generalized transduction?
a) Recombination
b) Translation

c) Replication
d) Transcription
Answer: a) Recombination

170. Which of the following techniques is commonly used for introducing foreign genes into an organism's genome?
a) PCR (Polymerase Chain Reaction)
b) Gel Electrophoresis
c) CRISPR-Cas9
d) Western Blotting
Answer: c) CRISPR-Cas9

171. What does the acronym "CRISPR" stand for?
a) Clustered Regularly Interspaced Short Palindromic Repeats
b) Controlled Recombination and Integration of Specific Patterns
c) Cellular Recombinant Integration for Specific Protein Regulation
d) Chromosomal Recombination In Synthetic Protein Regulation
Answer: a) Clustered Regularly Interspaced Short Palindromic Repeats

172. Which of the following is NOT a potential application of genetic engineering?
a) Gene therapy
b) Crop improvement
c) Cloning of extinct species
d) Nuclear fission
Answer: d) Nuclear fission

173. Which enzyme is commonly used to cut DNA at specific sequences in genetic engineering?
a) DNA polymerase b) Ligase
c) Restriction enzyme d) RNA polymerase

Answer: c) Restriction enzyme

174. The process of producing multiple identical copies of a gene or DNA sequence is known as:
a) DNA splicing b) Gene sequencing
c) DNA amplification d) Gene silencing
Answer: c) DNA amplification

175. Which technique allows scientists to determine the sequence of nucleotide bases in a DNA molecule?
a) Southern blotting
b) DNA microarray
c) DNA sequencing
d) Gene editing
Answer: c) DNA sequencing

176. What is the purpose of the "marker genes" used in genetic engineering?
a) To mark specific chromosomes for isolation
b) To tag genetically modified organisms
c) To facilitate the visualization of DNA under a microscope
d) To detect mutations in the genome
Answer: b) To tag genetically modified organisms

177. In genetic engineering, what is the function of a plasmid?
a) To replicate DNA sequences
b) To cut DNA at specific sites
c) To amplify RNA molecules
d) To isolate genes from a genome
Answer: a) To replicate DNA sequences

178. Which term refers to the deliberate modification of an organism's genome?
a) Gene therapy
b) Genetic manipulation

c) Genome editing
d) Genetic recombination
Answer: b) Genetic manipulation

179. Which of the following techniques allows for the insertion of a gene from one organism into the genome of another organism?
a) PCR b) Gel electrophoresis
c) Recombinant DNA technology d) Northern blotting
Answer: c) Recombinant DNA technology

180. What is the primary purpose of transformation in genetic engineering?
a) To alter an organism's DNA
b) To extract DNA from cells
c) To study RNA structures
d) To generate proteins
Answer: a) To alter an organism's DNA

181. Which of the following methods is commonly used for introducing foreign DNA into bacterial cells?
a) Electrophoresis
b) PCR (Polymerase Chain Reaction)
c) Transformation
d) Western blotting
Answer: c) Transformation

182. What is the role of a vector in genetic engineering transformation?
a) It transports genetic material into the nucleus
b) It amplifies DNA fragments
c) It carries foreign DNA into host cells
d) It transcribes RNA molecules
Answer: c) It carries foreign DNA into host cells

183. Which bacterial species is frequently used in genetic engineering due to its ability to take up foreign DNA?
a) Escherichia coli (E. coli)
b) Bacillus subtilis
c) Streptococcus pneumoniae
d) Pseudomonas aeruginosa
Answer: a) Escherichia coli (E. coli)

184. What process follows the uptake of DNA by a bacterial cell during transformation?
a) Replication b) Transcription
c) Translation d) Integration
Answer: d) Integration

185. True or False: Transformation is a natural process that occurs in all organisms.
Answer: False

186. Which of the following is NOT a method of DNA delivery in transformation?
a) Electroporation b) Heat shock
c) Sonication d) PCR amplification
Answer: d) PCR amplification

187. Which component of bacterial cells allows them to take up naked DNA during transformation?
a) Lipids b) Pili
c) Ribosome d) Flagella
Answer: b) Pili

188. What is the significance of using antibiotic resistance markers in plasmids during transformation experiments?
a) To prevent bacterial growth
b) To track transformed cells
c) To increase cell viability

d) To degrade foreign DNA
Answer: b) To track transformed cells

189. Which of the following is a common marker used to identify transformed cells in genetic engineering?
a) Antibiotic resistance
b) Fluorescence
c) Protein crystallization
d) Cell size
Answer: a) Antibiotic resistance

190. Which bacterium demonstrates high-frequency recombination (HFR) mapping?
a) E. coli b) S. cerevisiae
c) P. aeruginosa d) B. subtilis
Answer: a) E. coli

191. What is integrated into the E. coli chromosome in an HFR strain?
a) F plasmid b) R plasmid
c) pUC19 plasmid d) ColE1 plasmid
Answer: a) F plasmid

192. What does HFR stand for in genetic mapping?
a) High-Frequency Recombination
b) High-Fidelity Replication
c) Hyperactive Fusion Reaction
d) Homologous Fragment Receptor
Answer: a) High-Frequency Recombination

193. In HFR mapping, which part of the bacterial chromosome is transferred last during conjugation?
a) OriC b) Ter
c) Replicon d) Promoter
Answer: b) Ter

194. Which of the following is true regarding HFR strains?
a) They lack the F plasmid.
b) They transfer the entire F plasmid during conjugation.
c) They have the F plasmid integrated into the chromosome.
d) They replicate the F plasmid at a slower rate.
Answer: c) They have the F plasmid integrated into the chromosome.

195. What happens if an HFR cell conjugates with an F- cell?
a) The recipient cell becomes an F+ cell.
b) The recipient cell remains an F- cell.
c) The recipient cell acquires the F plasmid.
d) The recipient cell undergoes transduction.
Answer: b) The recipient cell remains an F- cell

196. Which process involves the transfer of genes from the bacterial chromosome to the recipient cell?
a) Transformation b) Transduction
c) Conjugation
d) Replication
Answer: c) Conjugation

197. The transfer of genetic material in HFR mapping occurs via which structure?
a) Pilus b) Plasmid
c) Ribosome d) Nucleoid
Answer: a) Pilus

198. HFR mapping helps in determining:
a) The rate of plasmid replication.
b) The location of genes on the bacterial chromosome.
c) The formation of recombinant plasmids.
d) The efficiency of transcription.

Answer: b) The location of genes on the bacterial chromosome

199. What is the order in which genes are transferred during HFR mapping?
a) Genes closest to the origin of transfer first.
b) Genes closest to the replication terminus first.
c) Random order due to pilus dynamics.
d) Genes are simultaneously transferred.
Answer: a) Genes closest to the origin of transfer first

200. Which molecular technique utilizes HFR mapping principles for gene transfer?
a) CRISPR-Cas9
b) South
c) PCR (Polymerase Chain Reaction)
d) Bacterial artificial chromosome (BAC) cloning
Answer: d) Bacterial artificial chromosome (BAC) cloning

201. What is the consequence of interrupted conjugation in HFR mapping?
a) Transfer of only a portion of the F plasmid
b) Transfer of entire F plasmid and bacterial chromosome
c) Termination of conjugation process
d) Transfer of the bacterial chromosome only
Answer: a) Transfer of only a portion of the F plasmid

202. HFR mapping is significant in understanding:
a) Bacterial transformation mechanisms.
b) The relationship between plasmids and antibiotics.
c) Bacterial gene transfer and genetic linkage.
d) The mechanism of bacterial sporulation.
Answer: c) Bacterial gene transfer and genetic linkage

203. Which term describes the transfer of genetic material via physical contact be b tween bacterial cells?
a) Transformation b) Transduction
c) Conjugation d) Replication
Answer: c) Conjugation

204. In an HFR strain, what enables the transfer of chromosomal genes to a recipient cell?
a) Plasmid replication machinery
b) Fertility plasmid integration
c) Pilus formation
d) Transformation competence
Answer: c) Pilus formation

205. What does the "F" in "F plasmid" stand for?
a) Fission b) Fertility
c) Fusion d) Fragmentation
Answer: b) Fertility

206. How is the HFR strain created in bacterial cells?
a) By mutating the pilus genes
b) By integrating the F plasmid into the chromosome
c) By disrupting the replication process
d) By inhibiting conjugation
Answer: b) By integrating the F plasmid into the chromosome

207. What can interrupt an ongoing HFR conjugation?
a) Mutations in the F plasmid
b) DNA repair enzymes
c) Endonucleases
d) The recipient cell's membrane proteins
Answer: a) Mutations in the F plasmid

208. The transfer of genetic material during HFR mapping results in:
a) Unidirectional gene transfer
b) Bidirectional gene transfer
c) Circular gene transfer
d) Linear gene transfer
Answer: b) Bidirectional gene transfer

209. HFR mapping primarily involves the study of:
a) Transfer RNA (tRNA) genes
b) Ribosomal RNA (rRNA) genes
c) Messenger RNA (mRNA) genes
d) Bacterial chromosome genes
Answer: d) Bacterial chromosome genes

210. Which phenomenon occurs when two genes are so close together that they are rarely separated during recombination?
a) Genetic recombination
b) Genetic linkage
c) Gene segregation
d) Crossover interference
Answer: b) Genetic linkage

211. HFR mapping elucidates the relative:
a) Sizes of plasmids in a bacterial cell
b) Order and distance between genes on a bacterial chromosome
c) Number of replication forks in a bacterial cell
d) Efficiency of transcriptional machinery in bacteria
Answer: b) Order and distance between genes on a bacterial chromosome

212. What is the primary role of the F plasmid in HFR mapping?
a) To confer antibiotic resistance

b) To regulate gene expression
c) To facilitate conjugative transfer
d) To induce sporulation
Answer: c) To facilitate conjugative transfer

213. What is the fate of an F- cell after conjugation with an HFR cell?
a) Becomes an HFR cell b) Remains an F- cell
c) Bec d) None
Answer b) remains an F-cell

214. What is genetic recombination?
a) The exchange of genetic material between non-homologous chromosomes
b) The process of producing offspring with new combinations of alleles
c) The formation of identical copies of DNA
d) The creation of genetic clones
Answer: b) The process of producing offspring with new combinations of alleles

215. Which enzyme is responsible for breaking and rejoining DNA strands during genetic recombination?
a) Ligase b) Helicase
c) Topoisomerase d) Recombinase
Answer: d) Recombines

216. In prokaryotes, what is the name of the process where genetic material is transferred from one bacterium to another through direct cell-to-cell contact?
a) Transformation b) Conjugation
c) Transduction d) Translocation
Answer: b) Conjugation

217. Crossing over occurs during which phase of meiosis?

A) Prophase I B) Metaphase II
C) Anaphase I D) Telophase II
Answer: a) Prophase I

218. Which of the following is an example of artificial genetic recombination?
a) Conjugation in bacteria
b) Crossing over during meiosis
c) PCR (Polymerase Chain Reaction)
D) Transduction in viruses
Answer: C) PCR (Polymerase Chain Reaction)

219. What is a recombinant DNA molecule?
A) DNA from different species combined together
B) DNA produced artificially by combining DNA from different sources
C) DNA that undergoes spontaneous recombination
D) DNA that replicates without any changes
Answer: B) DNA produced artificially by combining DNA from different sources

220. Which technique is used to create recombinant DNA?
A) CRISPR-Cas9 B) Gel electrophoresis
C) Southern blotting D) DNA cloning
Answer: D) DNA cloning

221. What is the function of restriction enzymes in genetic engineering?
A) To seal DNA strands together
B) To cut DNA at specific sequences
c) To copy DNA segments
d) To amplify DNA fragments
Answer: b) To cut DNA at specific sequences

222. Which organism was the first to have its entire genome sequenced using recombinant DNA technology?
a) Human b) E. coli
c) Mouse d) Fruit fly (Drosophila)
Answer: b) E. coli

223. What is the purpose of a plasmid in genetic engineering?
A) To cut DNA into smaller fragments
B) To amplify DNA segments
C) To transport foreign DNA into host cells
D) To join DNA fragments together
Answer: C) To transport foreign DNA into host cells

UNIT IV

1. What is the primary function of RNA splicing?
a) Translation
b) Transcription
c) Post-transcriptional modification
b) DNA replication
Answer: c) Post-transcriptional modification

2. Which type of RNA undergoes splicing?
a) MRNA b) TRNA
c) TRNA d) All of the above
Answer: a) MRNA

3. In eukaryotes, splicing occurs in the:
a) Nucleus b) Cytoplasm
c) Ribosome d) Endoplasmic reticulum
Answer: a) Nucleus

4. What is removed during the process of splicing?
a) Exons b) Introns
c) Codons d) Promoters
Answer: B) Introns

5. The splice donor site is characterized by the presence of:
a) AG b) GT
c) AT d) AC
Answer: B) GT

6. Which enzyme is responsible for catalyzing the splicing reaction?
a) DNA polymerase b) RNA polymerase
c) Ligase d) Spliceosome

Answer: d) Spliceosome

7. What is a spliceosome composed of?
a) DNA
b) Proteins and RNA
c) Lipids
d) Carbohydrates
Answer: b) Proteins and RNA

8. The branch point in splicing refers to:
a) The starting point of splicing
b) The point where the intron is removed
c) The site of ligation between exons
d) A conserved nucleotide within the intron
Answer: d) A conserved nucleotide within the intron

9. Alternative splicing results in:
a) Multiple proteins from a single gene
b) One protein from multiple genes
c) The removal of all introns
d) The addition of exons
Answer:) Multiple proteins from a single gene

ABOUT AUTHO

a) Huntington's disease
b) Sickle cell anemia
c) Cystic fibrosis
d) Tay-Sachs disease
Answer: b) Sickle cell anemia

13. Splicing is essential for the maturation of:
a) DNA b) MRNA
c) TRNA d) TRNA
Answer: b) MRNA

14. Which of the following is a small nuclear RNA (snRNA) involved in splicing?
a) TRNA b) RNA
c) U1 d) UAA
Answer: c) U1

15. The 5' cap is added to mRNA during:
a) Transcription b) Splicing
c) Translation d) Post-translation modification
Answer: a) Transcription

16. Which amino acid is often involved in the formation of
ructure during splicing?
ine b) Glycine
d) Adenosine
) Adenosine

cess of splicing is conserved across:
tes and eukaryotes b) Animals only
ly d) Fungi only
) Prokaryotes and eukaryotes

ipping leads to the production of mRNA with:
al exons b) Missing exons

c) No change in exons d) Altered codons
Answer: b) Missing exons

19. Which of the following is not a splicing variant?
a) Isoform b) Mutant
c) Homolog d) All are splicing variants
Answer: c) Homolog

20. The process of splicing is essential for:
a) DNA replication b) Protein folding
c) RNA stability d) Genetic recombination
Answer: c) RNA stability

21. Which of the following is a splicing factor?
a) DNA polymerase b) RNA helicase
c) SR proteins d) Ribozyme
Answer: c) SR proteins

22. Which of the following statements about splicing is false?
a) It occurs before transcription.
b) It removes introns from pre-mRNA.
c) It is catalyzed by the spliceosome.
d) It is a post-transcriptional modification.
Answer: a) It occurs before transcription

23. In splicing, the 3' splice site is characterized by the presence of:
a) AG b) GT
c) AT d) AC
Answer: a) AG

24. Which of the following is an example of mutually exclusive exons?
a) Intron retention b) Alternative 5' splice site
c) Alternative 3' splice site d) Cassette exon

Answer: d) Cassette exon

25. Which enzyme is responsible for adding the 5' cap to the MRNA?
a) RNA polymerase b) Ligase
c) Guanylyltransferase d) Spliceosome
Answer: c) Guanylyltransferase

26. What is the basic unit of the genetic code?
a) Nucleotide b)
c) Anticodon d) Gene
Answer: b)

27. How many nucleotides make up a codon?
a) One b) Two
c) Three d) Four
Answer: c) Three

28. Which of the following is not a component of a nucleotide in DNA?
a) Deoxyribose b) Phosphate
c) Ribose d) Nitrogenous base
Answer: c) Ribose

29. The genetic code is redundant, meaning that:
a) Each codon codes for multiple amino acids
b) Each amino acid is coded by multiple codons
c) There is a one-to-one correspondence between codons and amino acids
d) Codons and amino acids are unrelated
Answer: b) Each amino acid is coded by multiple codons

30. The start codon that initiates protein synthesis is:
a) AUG b) UAA
c) UAG d) UGA

Answer: a) AUG

31. What is the role of tRNA in translation?
a) It carries amino acids to the ribosome
b) It reads the mRNA codons
c) It forms peptide bonds between amino acids
d) It serves as a template for mRNA synthesis
Answer: a) It carries amino acids to the ribosome

32. Which of the following is a stop codon?
a) AUG b) UAA
c) GCA d) CCC
Answer: b) UAA

33. The genetic code is degenerate, meaning that:
a) It can be altered by mutations
b) It is universal in all living organisms
c) Some amino acids are coded by multiple codons
d) It is a fixed set of instructions
Answer: c) Some amino acids are coded by multiple codons

34. The process of decoding mRNA to synthesize a polypeptide is known as:
a) Transcription b)
c) Replication d) Transduction
Answer: b)

35. The enzyme responsible for adding amino acids to tRNA is:
a) RNA polymerase b) Helicase
c) Ligase d) Aminoacyl-tRNA synthetase
Answer: d) Aminoacyl-tRNA synthetase

36. How many different amino acids are commonly found in proteins?
a) 20 b) 4
c) 5 d) 10
Answer: a) 20

37. Which of the following is NOT a type of point mutation?
a) Missense mutation
b) Nonsense mutation
c) Silent mutation
d) Frameshift mutation
Answer: d) Frameshift mutation

38. In which cellular organelle does translation take place?
a Nucleus b) Ribosome
c) Endoplasmic reticulum d) Golgi apparatus
Answer: b) Ribosome

39. The genetic code is nearly universal, meaning that:
a) It is the same in all living organisms
b) It is specific to each species
c) It changes over time
d) It is limited to eukaryotes
Answer: a) It is the same in all living organisms

40. The anticodon of a tRNA molecule is complementary to the:
a) Codon on MRNA
b) Amino acid attached to the tRNA
c) Ribosomal RNA
d) Promoter region of DNA
Answer: a) Codon on MRNA

41. What is the significance of the wobble hypothesis in the genetic code?

a) It explains how mutations occur in the genetic code
b) It describes the flexibility in base pairing at the third position of the codon
c) It suggests that the genetic code is not universal
d) It is a model for DNA replication
Answer: b) It describes the flexibility in base pairing at the third position of the codon

42. The term "reading frame" in the context of the genetic code refers to:
a) The sequence of nucleotides in DNA
b) The order of amino acids in a protein
c) The way ribosomes move along MRNA
d) The proper alignment of tRNA molecules
Answer: c) The way ribosomes move along MRNA

43. Which of the following is a function of the genetic code?
a) DNA replication b) Protein synthesis
c) Cell division d) ATP synthesis
Answer: b) Protein synthesis

44. The genetic code is said to be non-overlapping, meaning that:
a) Codons do not overlap with each other
b) Genes do not overlap with each other
c) A nucleotide can only be part of one codon
d) Amino acids do not overlap in a polypeptide chain
Answer: c) A nucleotide can only be part of one codon

45. The term "codon bias" refers to:
a) The preference for certain codons to code for specific amino acids
b) The random distribution of codons in mRNA
c) The speed at which codons are decoded during translation
d) The tendency of codons to mutate frequently

Answer: a) The preference for certain codons to code for specific amino acids

46. The genetic code is composed of how many letters or bases?
a) 3 b) 4
c) 20 d) 64
Answer: b)64

47. Which of the following is an example of a frameshift mutation?
a) Substitution b) Insertion
c) Deletion d) Duplication
Answer: b) Insertion

48. The sequence of codons in mRNA is read in which direction during translation?
a) 3' to 5' b) 5' to 3'
c) 5' to 5' d) 3' to 3'
Answer: b) 5' to 3'

49. The genetic code is considered to be a triplet code because:
a) It consists of three bases per codon
b) It codes for three different types of molecules
c) It is found in three different locations within the cell
d) It involves three stages of protein synthesis
Answer: a) It consists of three bases per codon

50. Which of the following is an example of a silent mutation?
a) Substitution b) Insertion
c) Deletion d) None of the above
Answer: d) None of the above

51. What is recombination in genetics?

a) Mutation
b) Exchange of genetic material between homologous chromosomes
c) DNA replication error
d) Chromosomal deletion
Answer: b) Exchange of genetic material between homologous chromosomes

52. Which phase of the cell cycle does recombination primarily occur?
a) G1 phase b) S phase
c) G2 phase d) Prophase
Answer: b) S phase

53. What enzyme is responsible for catalyzing the process of recombination?
a) DNA polymerase b) DNA ligase
c) Recombinase d) RNA polymerase
Answer: c) Recombinase

54. Which type of recombination involves the exchange of genetic material between non-sister chromatids of homologous chromosomes?
a) Crossing over b) Transposition
c) Transformation d) Transduction
Answer: a) Crossing over

55. In eukaryotes, where does crossing over primarily occur?
a) G1 phase b) S phase
c) Meiotic prophase I d) Mitotic prophase
Answer: c) Meiotic prophase I

56. What is the main purpose of recombination in meiosis?
a) Repair DNA damage
b) Increase genetic diversity

c) Facilitate DNA replication
d) Suppress gene expression
Answer: b) Increase genetic diversity

57. Which of the following is a structure that forms during crossing over and consists of two non-sister chromatids?**
a) Centromere b) Synaptonemal complex
c) Kinetochore d) Telomere
Answer: b) Synaptonemal complex

58. What is gene conversion in the context of recombination?
a) Mutation in a specific gene
b) The alteration of allele frequencies within a gene
c) The unidirectional transfer of genetic material between homologous chromosomes
d) The replication of a gene sequence
Answer: c) The unidirectional transfer of genetic material between homologous chromosomes

59. In bacterial recombination, what is a plasmid?
a) A type of virus
b) Circular DNA molecule separate from the chromosomal DNA
c) A segment of RNA
d) A type of organelle
Answer: b) Circular DNA molecule separate from the chromosomal DNA

60. What is the Holliday junction in the context of recombination?
a) A type of DNA polymerase
b) A structure formed during DNA replication
c) A temporary four-stranded structure during homologous recombination
d) A type of genetic mutation

Answer: c) A temporary four-stranded structure during homologous recombination

61. Which of the following is not a mechanism of genetic recombination?
a) Transformation b) Transcription
c) Conjugation d) Transduction
Answer: b) Transcription

62. In yeast, what is the term for the process of mating-type switching through recombination?
a) Plasmid transfer
b) Transformation
c) Homothallism
d) Conjugation
Answer: c) Homothallism

63. Which of the following is a consequence of chromosomal crossover during meiosis?
a) Synthesis of new DNA strands
b) Separation of sister chromatids
c) Shuffling of genetic material between homologous chromosomes
d) Replication of the centromere
Answer: c) Shuffling of genetic material between homologous chromosomes

64. What is gene linkage?
a) Independent assortment of genes
b) Genes located on the same chromosome
c) The process of gene duplication
d) The formation of a new gene
Answer: b) Genes located on the same chromosome

65. Which enzyme is involved in resolving Holliday junctions during recombination?
a) DNA helicase b) DNA ligase
c) DNA topoisomerase d) Resolvase
Answer: d) Resolvase

66. What is the name of the phenomenon where genes located close to each other on a chromosome tend to be inherited together?
a) Genetic drift b) Genetic linkage
c) Genetic mapping d) Gene conversion
Answer: b) Genetic linkage

67. In bacteria, which process involves the direct transfer of genetic material from one bacterium to another through a pilus?
a) Conjugation b) Transformation
c) Transduction d) Transposition
Answer: a) Conjugation

68. What is the role of chi sites in bacterial recombination?
a) Initiate DNA replication
b) Serve as recognition sites for DNA polymerase
c) Promote homologous recombination
d) Function as transcription start sites
Answer: c) Promote homologous recombination

69. Which of the following organisms does not undergo meiotic recombination?
a) Humans b) Yeast
c) Bacteria d) Fruit flies
Answer: c) Bacteria

70. What is the term for the region of homology between two DNA molecules that participate in recombination?

a) Recombinase site b) Homologous region
c) Recombinant DNA d) Recombination hotspot
Answer: B) Homologous region

71. What is the significance of recombination in evolution?
a) Accelerates mutation rates
b) Reduces genetic diversity
c) Increases genetic diversity
d) Inhibits gene expression
Answer: c) Increases genetic diversity

72. Which of the following is an example of site-specific recombination?
a) Crossing over b) Transposition
c) Homologous recombination d) Conjugation
Answer: b) Transposition

73. What is an oncogene?
a) Tumor suppressor gene b) Cancer-causing gene
c) DNA repair gene d) Apoptosis gene
Answer: b) Cancer-causing gene

74. Which of the following is a proto-oncogene?
a) p53 b) BRCA1
c) c-myc d) PTEN
Answer: c) c-myc

75. What is the normal function of proto-oncogenes?
a) Promote cell division
b) Inhibit apoptosis
c) Suppress tumor growth
d) Repair DNA damage
Answer: a) Promote cell division

76. Which oncogene is commonly associated with breast cancer?
a) KRAS b) HER2/neu
c) APC d) BRAF
Answer: b) HER2/neu

77. The mutation of which oncogene is commonly found in lung cancer?
a) BCL2 b) EGFR
c) Rub d) NF1
Answer: b) EGFR

78. Which oncogene is associated with chronic myeloid leukemia (CML)?
a) c-myc b) BCR-ABL
c) p53 d) BRCA2
Answer: b) BCR-ABL

79. What is the function of the RAS oncogene?
a) Cell cycle regulation
b) Apoptosis inhibition
c) Signal transduction
d) DNA repair
Answer: c) Signal transduction

80. Which tumor suppressor gene is commonly mutated in colorectal cancer?
a) BRCA1 b) TP53
c) APC d) PTEN
Answer: c) APC

81. Which oncogene is associated with melanoma?
a) c-myc b) BRAF
c) KRAS d) RET
Answer: b) BRAF

82. The p53 gene is an example of:
a) Proto-oncogene b) Oncogene
c) Tumor suppressor gene d) DNA repair gene
Answer: c) Tumor suppressor gene

83. What is the role of the MYCN oncogene in cancer?
a) Cell cycle regulation b) Apoptosis inhibition
c) Angiogenesis promotion d) DNA repair
Answer: c) Angiogenesis promotion

84. Which oncogene is associated with chronic lymphocytic leukemia (CLL)?
a) BCL2 b) c-myc
c) FLT3 d) JAK2
Answer: a) BCL2

85. Which oncogene is commonly mutated in pancreatic cancer?
a) TPAN b) KRAS
c) EGFR d) HER2/neu
Answer: b) KRAS

86. The BRCA1 and BRCA2 genes are examples of:
a) Proto-oncogenes b) Oncogenes
c) Tumor suppressor genes d) DNA repair genes
Answer: c) Tumor suppressor genes

87. Which oncogene is commonly associated with stomach cancer (gastric cancer)?
a) RET b) HER2/neu
c) c-myc d) BRAF
Answer: b) HER2/neu

88. The NF1 gene is associated with which genetic disorder that predisposes individuals to tumors?
a) Neurofibromatosis type 1
b) Li-Fraumeni syndrome
c) Von Hippel-Lindau syndrome
d) Fanconi anemia
Answer: a) Neurofibromatosis type 1

89. Which oncogene is commonly associated with thyroid cancer?
a) RET b) KRAS
c) BCR-ABL d) JAK2
Answer: a) RET

90. The PIK3CA gene is often mutated in which type of cancer?
a) Breast cancer b) Lung cancer
c) Colorectal cancer d) Ovarian cancer
Answer: a) Breast cancer

91. Which oncogene is commonly mutated in non-small cell lung cancer (NSCLC)?
a) EGFR b) c-myc
c) KRAS d) BCL2
Answer: a) EGFR

92. The APC gene is associated with the development of:
a) Breast cancer b) Colorectal cancer
c) Lung cancer d) Prostate cancer
Answer: d) Colorectal cancer

93. Which oncogene is commonly associated with acute myeloid leukemia (AML)?
a) FLT3 b) HER2/neu
c) BRAF d) p53

Answer: a) FLT3

94. The JAK2 gene mutation is commonly found in which type of leukemia?
a) Chronic myeloid leukemia (CML)
b) Acute lymphoblastic leukemia (ALL)
c) Chronic lymphocytic leukemia (CLL)
d) Myelodysplastic syndrome (MDS)
Answer: a) Chronic myeloid leukemia (CML)

95. Which oncogene is commonly mutated in liver cancer (hepatocellular carcinoma)?
a) TP53 b) KRAS
c) c-myc d) TERT
Answer: d) TERT

96. The HER2/neu gene is amplified in a subset of which cancer?
a) Lung cancer b) Breast cancer
c) Pancreatic cancer d) Ovarian cancer
Answer: b) Breast cancer

97. The EML4-ALK fusion gene is associated with which type of cancer?
a) Lung cancer b) Breast cancer
c) Colorectal cancer d) Prostate cancer
Answer: a) Lung cancer

98. Which of the following is a characteristic feature of tumor suppressor genes?
a) Gain of function mutations
b) Code for proteins that promote cell growth
c) Loss of function mutations
d) Overexpression in cancer cells
Answer: c) Loss of function mutations

99. Which tumor suppressor gene is commonly mutated in Li-Fraumeni syndrome?
a) TP53 b) BRCA1
c) RB1 d) PTEN
Answer: a) TP53

100. The retinoblastoma gene (RB1) is associated with which type of cancer?
a) Breast cancer b) Colorectal cancer
c) Retinoblastoma d) Lung cancer
Answer: c) Retinoblastoma

UNIT V

1. The ATM gene is associated with an increased risk of which type of cancer?
a) Breast cancer b) Colorectal cancer
c) Pancreatic cancer d) Ovarian cancer
Answer: a) Breast cancer

2. Loss of function mutations in the DICER1 gene are associated with an increased risk of which cancer?
a) Lung cancer b) Ovarian cancer
c) Thyroid cancer d) Pancreatic cancer
Answer: b) Ovarian cancer

3. The BRCA1 gene is located on which chromosome?
a) Chromosome 13 b) Chromosome 17
c) Chromosome 21 d) Chromosome 22

4. Which tumor suppressor gene is involved in the regulation of the cell cycle by inhibiting cyclin-dependent kinases?
a) APC b) PTEN
c) p16 (CDKN2A) d) BRCA2
Answer: c) p16 (CDKN2A)

5. Loss of function mutations in which tumor suppressor gene is associated with hereditary breast and ovarian cancer syndrome?
a) BRCA1 b) TP53
c) APC d) RB1
Answer: a) BRCA1

6. Mutations in the APC gene are commonly found in which type of cancer?
a) Breast cancer b) Colorectal cancer

c) Pancreatic cancer d) Ovarian cancer
Answer: b) Colorectal cancer

7. Which tumor suppressor gene is commonly mutated in Cowden syndrome?
a) APC b) PTEN
c) BRCA2 d) TP53
Answer: b) PTEN

8. The NF1 gene is associated with which genetic disorder and an increased risk of certain tumors?
a) Neurofibromatosis type 1
b) Lynch syndrome
c) Li-Fraumeni syndrome
d) Von Hippel-Lindau syndrome
Answer: a) Neurofibromatosis type 1

9. Which tumor suppressor gene is associated with the formation of hamartomas in various organs and tissues?
a) PTEN b) APC
c) NF1 d) BRCA1
Answer: a) PTEN

10. Mutations in the CDH1 gene are associated with an increased risk of which cancer?
a) Colorectal cancer b) Breast cancer
c) Pancreatic cancer d) Ovarian cancer
Answer: a) Breast cancer

11. Loss of function mutations in which gene is commonly observed in Gorlin syndrome (nevoid basal cell carcinoma syndrome)?
a) BRCA2 b) PTCH1
c) CDKN2A d) APC
Answer: b) PTCH1

12. The p53 protein, encoded by the TP53 gene, is commonly referred to as the "Guardian of the _____.
a) Cell cycle b) Genome
c) Apoptosis d) Mitosis
Answer: b) Genome

13. Which tumor suppressor gene is associated with the regulation of Wnt signaling pathway and is often mutated in colorectal cancer?
a) TP53 b) APC
c) PTEN d) BRCA1
Answer: b) APC

14. Mutations in the BRCA2 gene are primarily associated with an increased risk of which cancer?
a) Colorectal cancer b) Ovarian cancer
c) Prostate cancer d) Lung cancer
Answer: c) Prostate cancer

15. The BRCA1 and BRCA2 genes are involved in the repair of which type of DNA damage?
a) Single-strand breaks
b) Double-strand breaks
c) Mismatched bases
d) Pyrimidine dimers
Answer: b) Double-strand breaks

16. Loss of function mutations in the STK11 gene are associated with which syndrome and an increased risk of various cancers?
a) Lynch syndrome b) Peutz-Jeghers syndrome
c) Cowden syndrome d) Gorlin syndrome
Answer: b) Peutz-Jeghers syndrome

17. Which tumor suppressor gene is involved in the regulation of apoptosis and is commonly mutated in chronic lymphocytic leukemia (CLL)?
a) TP53 b) BAX
c) ATM d) BRCA1
Answer: b) BAX

18. Mutations in the MEN1 gene are associated with which hereditary syndrome and an increased risk of multiple endocrine neoplasia?
a) Gorlin syndrome
b) Lynch syndrome
c) Cowden syndrome
d) Multiple endocrine neoplasia type 1
Answer: d) Multiple endocrine neoplasia type 1

19. The VHL gene is associated with the development of tumors in which organ system?
a) Central nervous system b) Kidneys
c) Gastrointestinal tract d) Thyroid
Answer: b) Kidneys

20. Loss of function mutations in the BRIP1 gene are associated with an increased risk of which cancer?
a) Ovarian cancer b) Colorectal cancer
c) Pancreatic cancer d) Endometrial cancer
Answer: a) Ovarian cancer

21. Which tumor suppressor gene is commonly mutated in hereditary nonpolyposis colorectal cancer (HNPCC), also known as Lynch syndrome?
a) APC b) TP53
c) MLH1 d) BRCA1
Answer: c) MLH1

22. What is metastasis?
a) Primary tumor growth
b) Spread of cancer cells to distant sites
c) Benign tumor formation
d) Inflammation process
Answer: b) Spread of cancer cells to distant sites

23. Which of the following is a common route of metastasis for solid tumors?
a) Bloodstream b) Lymphatic system
c) Nervous system d) All of the above
Answer: d) All of the above

24. What is the primary purpose of cancer cells in metastasis?
a) Securing nutrients
b) Evading the immune system
c) Forming new blood vessels
d) Invading surrounding tissues and spreading to other parts
Answer: d) Invading surrounding tissues and spreading to other parts

25. Which term refers to the ability of cancer cells to break away from the primary tumor and invade nearby tissues?
a) Angiogenesis b) Metastasis
c) Invasion d) Proliferation
Answer: c) Invasion

26. The process of cancer cell migration through the bloodstream is called:
a) Angiogenesis b) Hematopoiesis
c) Intravasation d) Extravasation
Answer: c) Intravasation

27. What is the role of angiogenesis in metastasis?

a) Formation of new blood vessels
b) Destruction of blood vessels
c) Repair of damaged blood vessels
d) None of the above
Answer: a) Formation of new blood vessels

28. Which of the following is a key factor that influences metastatic potential?
a) Size of the primary tumor
b) Histological type of tumor
c) Genetic mutations
d) All of the above
Answer: d) All of the above

29. The first step in metastasis is often:
a) Angiogenesis b) Invasion
c) Proliferation d) Apoptosis
Answer: b) Invasion

30. Which cellular structure is crucial for cancer cells to attach to the endothelium during extravasation?
a) Microtubules b) Fibrils
c) Integrins d) Ribosomes
Answer: c) Integrins

31. The "seed and soil" hypothesis in metastasis was proposed by:
a) Rudolf Virchow b) Stephen Paget
c) James Watson d) Paul Farmer
Answer: b) Stephen Paget

32. Which type of cancer cell dissemination occurs via the lymphatic system?
a) Hematogenous dissemination
b) Lymphatic dissemination

c) Intravascular dissemination
d) Epithelial dissemination
Answer: b) Lymphatic dissemination

33. The Warburg effect is associated with:
a) Metastasis b) Angiogenesis
c) Altered metabolism in cancer cells d) Apoptosis
Answer: c) Altered metabolism in cancer cells

34. What is the primary function of the sentinel lymph node in cancer metastasis?
a) Initiating angiogenesis
b) Acting as a barrier against metastasis
c) Serving as the first lymph node to receive drainage from the tumor
d) Producing growth factors
Answer: c) Serving as the first lymph node to receive drainage from the tumor

35. Which molecule is often involved in the adhesion of cancer cells to the extracellular matrix during metastasis?
a) Collagen b) Insulin
c) Hemoglobin d) Cholesterol
Answer: a) Collagen

36. The process of cancer cells reactivating embryonic developmental pathways is known as:
a) Metaplasia
b) EMT (Epithelial-Mesenchymal Transition)
c) Apoptosis
d) Anaplasia
Answer: b) EMT (Epithelial-Mesenchymal Transition)

37. What is the primary purpose of circulating tumor cells (CTCs) in metastasis?

a) Forming new tumors in the bloodstream
b) Evading the immune system
c) Facilitating intravasation
d) Colonizing distant organs
Answer: d) Colonizing distant organs

38. Which of the following is a risk factor for the development of metastasis?
a) Healthy lifestyle b) Early tumor detection
c) Chronic inflammation d) Regular exercise
Answer: c) Chronic inflammation

39. The ability of cancer cells to resist programmed cell death is known as:
a) Apoptosis b) Necrosis
c) Angiogenesis d) Apoptotic resistance
Answer: d) Apoptotic resistance

40. The pre-metastatic niche refers to:
a) The initial site of primary tumor formation
b) The environment that promotes metastasis at distant sites
c) The tumor microenvironment
d) The region of angiogenesis
Answer: b) The environment that promotes metastasis at distant sites

41. Which type of cancer cells have a higher likelihood of metastasizing?
a) Well-differentiated cells
b) Moderately differentiated cells
c) Poorly differentiated cells
d) Benign tumor cells
Answer: c) Poorly differentiated cells

42. Which signaling pathway is commonly dysregulated in metastatic cancers?
a) Hedgehog pathway b) Wnt/β-catenin pathway
c) Notch pathway d) JAK/STAT pathway
Answer: b) Wnt/β-catenin pathway

43. The term "micrometastasis" refers to:
a) Small primary tumors
b) Tiny metastatic lesions
c) Early stages of invasion
d) Cancer cells in the bloodstream
Answer: b) Tiny metastatic lesions

44. Which of the following is an example of a metastasis suppressor gene?
a) BRCA1 b) TP53
c) PTEN d) KRAS
Answer: c) PTEN

45. The process of cancer cells entering the circulatory system is known as:
a) Hematopoiesis b) Intravasation
c) Hemangiogenesis d) Embolization
Answer: b) Intravasation

46. Which imaging technique is commonly used to detect metastases in organs such as the liver and lungs?
a) X-ray b) Magnetic Reson

47. What is the primary function of the p53 gene?
a) Cell division b) Apoptosis
c) DNA repair d) Protein synthesis
Answer: b) Apoptosis

48. Which type of gene is p53 classified as?

a) Proto-oncogene b) Tumor suppressor gene
c) Oncogene d) Mutator gene
Answer: b) Tumor suppressor gene

49. Loss of function mutations in the p53 gene are commonly associated with which disease?
a) Diabetes b) Alzheimer's
c) Cancer d) HIV
Answer: c) Cancer

50. What is the nickname often given to p53 due to its role in preventing cancer development?
a) Guardian of the Genome b) Master of Division
c) Cell Commander d) DNA Repair Wizard
Answer: a) Guardian of the Genome

51. Which cellular process does p53 regulate to prevent the formation of cancerous cells?
a) Glycolysis
b) Angiogenesis
c) Cell cycle arrest
d)Muscle contraction
Answer: c. Cell cycle arrest

52. What is the name of the protein product encoded by the p53 gene?
a) p21 b) Cyclin
c) Rb d) p62
Answer: a) p21

53. In response to DNA damage, p53 activates DNA repair mechanisms by interacting with which protein?
a) DNA polymerase b) BRCA1
c) ATM kinase d) Telomerase
Answer: c) ATM kinase

54. Which of the following is NOT a factor that can lead to the activation of the p53 gene?
a) DNA damage b) Hypoxia
c) Nutrient abundance d) Oncogene activation
Answer: c) Nutrient abundance

55. What is the consequence of a mutated or non-functional 53 gene in terms of cell cycle regulation?
a) Accelerated cell cycle b) Inhibited cell cycle
c) Unregulated cell cycle d) No effect on the cell cycle
Answer: c) Unregulated cell cycle

56. Which of the following cancers is NOT commonly associated with p53 mutations?
a) Breast cancer b) Colorectal cancer
c) Lung cancer d) Leukemia
Answer: d) Leukemia

57. In addition to apoptosis and cell cycle regulation, what other cellular process does p53 influence?
a) Cellular respiration b) Angiogenesis
c) RNA transcription d) Mitosis
Answer: b) Angiogenesis

58. Which domain of the p53 protein is responsible for binding to DNA and activating target genes?
a) Transactivation domain b) DNA-binding domain
c)Oligomerization domain d)Tetramerization domain
Answer: b) DNA-binding domain

59. What is the significance of p53 in preventing the propagation of damaged DNA to daughter cells during cell division?
a) It promotes DNA replication b) It induces cell cycle arrest

c) It enhances mitosis d) It inhibits apoptosis
Answer: b) It induces cell cycle arrest

60. Which protein, when stabilized by p53, plays a crucial role in promoting apoptosis?
a) Bcl-2 b) p21
c) Caspase-3 d) Cyclin D
Answer: c) Caspase-3

61. What is the name of the pathway through which p53 is degraded in normal cellular conditions?
a) NF-κB pathway b) PI3K/Akt pathway
c) JAK/STAT pathway d) Ubiquitin-proteasome pathway
Answer: d) Ubiquitin-proteasome pathway

62. Which of the following is a negative regulator of p53, inhibiting its activity?
a) MDM2 b) ATM kinase
c) p21 d) BRCA1
Answer: a) MDM2

63. What type of mutation is most commonly observed in the p53 gene in cancer cells?
a) Missense mutation b) Nonsense mutation
c) Frameshift mutation d) Silent mutation
Answer: a) Missense mutation

64. Which cellular process does p53 play a role in to limit tumor angiogenesis?
a) Inflammation b) DNA replication
c) Telomere elongation d) Inhibition of VEGF expression
Answer: d) Inhibition of VEGF expression

65. What is the function of the p53 protein's transactivation domain?

a) DNA binding b) Oligomerization
c) Protein degradation d) Activation of target genes
Answer: d) Activation of target genes

66. Which phase of the cell cycle does p53 primarily regulate?
a) G1 phase b) S phase
c) G2 phase d) M phase
Answer: a) G1 phase

67. What is the role of p53 in response to hypoxia (low oxygen levels)?
a) Inhibition of apoptosis
b) Activation of angiogenesis
c) Induction of cell cycle arrest
d) Promotion of DNA repair
Answer: c) Induction of cell cycle arrest

68. Which factor is responsible for stabilizing and activating p53 in response to DNA damage?
a) ATM kinase b) Cyclin D
c) MDM2 d) Telomerase
Answer: a) ATM kinase

69. Which of the following is a downstream target of p53 involved in promoting cell cycle arrest?
a) Cyclin D b) Cyclin E
c) p21 d) CDK4
Answer: c) p21

70. In what cellular compartment does the majority of p53 protein reside under normal conditions?
a) Nucleus
b) Cytoplasm
c) Golgi apparatus
Answer: a) Nucleus

71.What is the primary purpose of a protein microarray?
a) DNA sequencing
b) Protein-protein interactions
c) Antibiotic synthesis
d) Cell division
Answer: b) Protein-protein interactions

72. In a protein microarray, proteins are immobilized on a solid support. What is commonly used as the solid support?
a) Glass slides b) Metal plates
c) Plastic sheets d) Wooden chips
Answer: a) Glass slides

73. Which technique is often used to detect protein binding on a microarray?
a) Mass spectrometry
b) Western blotting
c) Polymerase chain reaction (PCR)
d) Fluorescence imaging
Answer: d) Fluorescence imaging

74. What is the term for the process of transferring proteins from a gel to a solid support membrane?
a) Hybridization b) Blotting
c) Denaturation d) Ligation
Answer: b) Blotting

75. Which of the following is a common application of protein microarrays?
a) Gene editini b) Drug discovery
c) Photosynthesis d) Soil erosion
Answer: b) Drug discovery

76. What type of interactions can be studied using protein microarrays?
a) Only DNA-protein interactions
b) Only protein-lipid interactions
c) Protein-protein interactions
d) Only RNA-protein interactions
Answer: c) Protein-protein interactions

77. Which method is commonly used for protein immobilization on microarrays?
a) PCR b) ELISA
c) Spotting D) Southern blotting
Answer: C) Spotting

78. What is the role of a capture antibody in a protein microarray?
a) Amplification of signals
b) Immobilization of proteins
c) Detection of target proteins
d) Denaturation of proteins
Answer: c) Detection of target proteins

79. Which of the following is an advantage of protein microarrays over traditional assays?
a) Limited throughput
b) Low sensitivity
c) High throughput
d) Time-consuming
Answer: c) High throughput

80. What is the function of a reference protein in a microarray experiment?
a) To bind to target proteins
b) To serve as a control
c) To denature proteins

d) To amplify signals
Answer: c) To serve as a control

81. In a reverse-phase protein microarray, what is the principle of protein separation?
a) Charge b) Size
c) Hydrophobicity d) Shape
Answer: c) Hydrophobicity

82. Which of the following is a common labelling method for proteins in microarrays?
a) Radioactive isotopes b) Antibodies
c) DNA probes d) Fluorescent dyes
Answer: d) Fluorescent dyes

83. What is the primary advantage of using a multiplexed protein microarray?
a) Increased cost
b) Simultaneous analysis of multiple proteins
c) Reduced sensitivity
d) Longer experimental time
Answer: b) Simultaneous analysis of multiple proteins

84. Question: Which of the following is a potential limitation of protein microarrays?
a) Low cost b) Limited dynamic range
c) Short incubation times d) Reduced specificity
Answer: b) Limited dynamic range

85. What is the purpose of blocking agents in a protein microarray experiment?
a) To enhance protein binding
b) To prevent non-specific binding
c) To denature proteins
d) To amplify signals

Answer: b) To prevent non-specific binding

86. In a protein microarray, what is the function of a linker molecule?
a) Immobilization of proteins
b) Signal amplification
c) Separation of proteins
d) Detection of proteins
Answer: a) Immobilization of proteins

87. What is the term for the systematic study of the interactions between proteins in a cell?
a Proteomics b) Genomics
c) Metabolomics d) Transcriptomics
Answer: a) Proteomics

88. Which technology is often used for data analysis in protein microarrays?
a) Gel electrophoresis b) Next-generation sequencing
c) Bioinformatics d) PCR
Answer: c) Bioinformatics

89. What is the primary advantage of using recombinant proteins in microarray experiments?
a) Increased cost b) Higher specificity
c) Reduced stability d) Lower sensitivity
Answer: b) Higher specificity

90. What is the significance of the "negative control" in a protein microarray experiment?
a) It provides a reference protein
b) It ensures the specificity of the assay
c) It amplifies signals
d) It denatures proteins
Answer: b) It ensures the specificity of the assay

91. Which type of microarray allows the detection of post-translational modifications of proteins?
a) DNA microarray
b) Antibody microarray
c) Reverse-phase protein microarray
d) RNA microarray
Answer: c) Reverse-phase protein microarray

92. What is the term for the pattern of proteins recognized by an antibody in a microarray?
a) Signal amplification b) Binding profile
c) Denaturation d) Blotting
Answer: b) Binding profile

93. Which of the following is a potential challenge in protein microarray experiments?
a) High specificity b) Low sensitivity
c) Short incubation times d) Lack of multiplexing
Answer: b) Low sensitivity

94. What is the role of a control protein in a protein microarray experiment?
a) To bind to target proteins b) To serve as a reference
c) To denature proteins d) To amplify signals

95. What is the term for uncontrolled cell division that leads to the formation of a tumor?
a) Apoptosis b) Metastasis
c) Hyperplasia d) Cancerogenesis
Answer: c) Hyperplasia

96. Which of the following is a characteristic of cancer cells?
a) Controlled cell cycle b) Differentiated structure
c) Anchorage dependence d) Contact inhibition

Answer: d) Contact inhibition

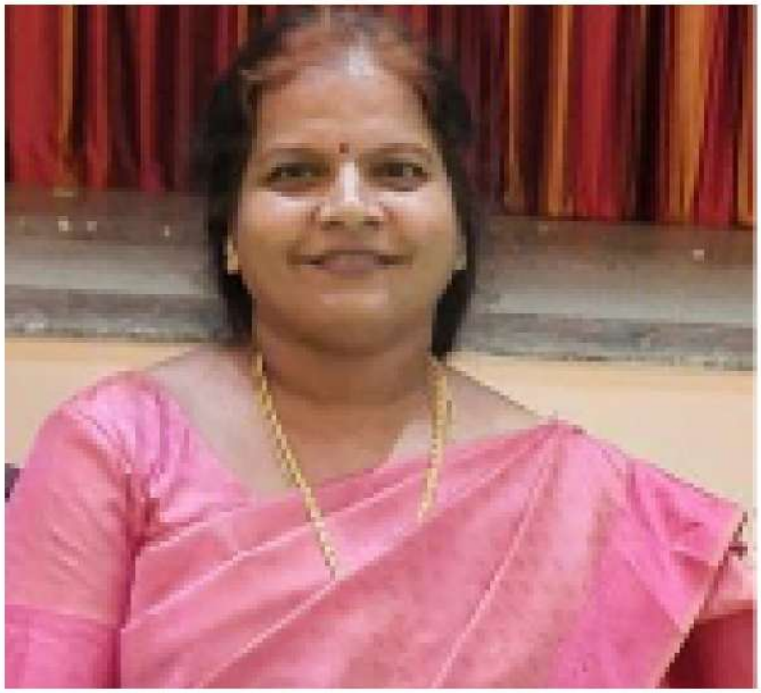
97. What is the primary cause of most cancers?
a) Viral infections b) Genetic mutations
c) Aging d) Hormonal imbalanc
Answer: b) Genetic mutations

98. Which of the following is a proto-oncogene that, when mutated, can contribute to cancer development?
a) p53 b) BRCA1
c) Ras d) APC
Answer: c) Ras

99. What is the process by which cancer cells spread to other parts of the body?
a) Apoptosis b) Angiogenesis
c) Metastasis d) Hyperplasia
Answer: c) Metastasis

100. What is the term for programmed cell death that helps prevent the development of cancer?
a) Necrosis b) Hyperplasia
c) Apoptosis d) Mitosis
Answer: c) Apoptosis

ABOUT AUTHOR



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ISBN 978-93-340-1410-5
9 789334 014105