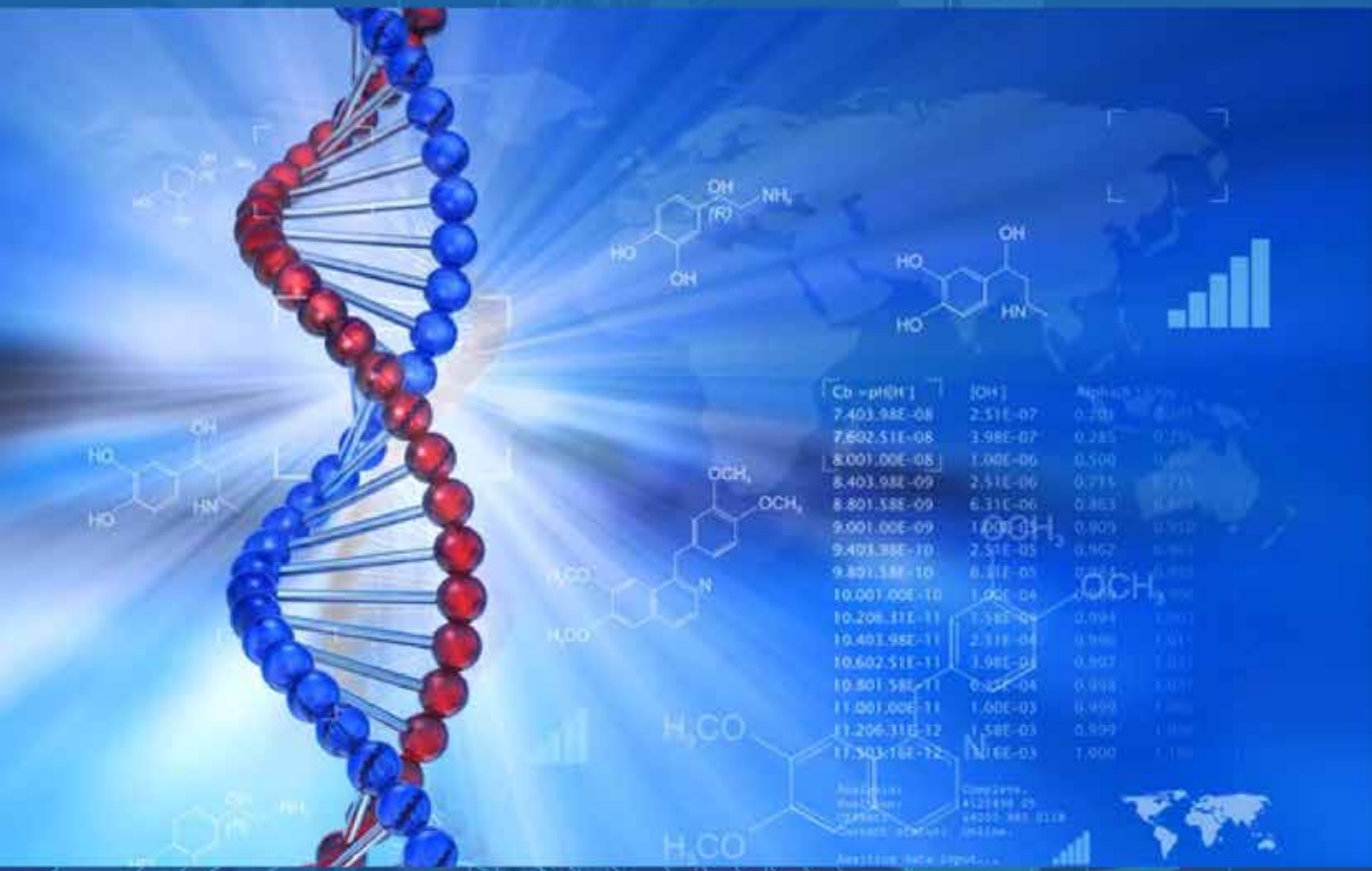
GENETIC ENGINEERING

MULTIPLE CHOICE QUESTION BANK



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UNIT-I

1. Who is considered the father of genetic engineering?

   a. James Watson b. Francis Crick

   c. Paul Berg d. Gregor Mendel

2. In 1972, Paul Berg successfully combined DNA from two different organisms. What was this technique called?

   a. Gene therapy

   b. Recombinant DNA technology

   c. Polymerase chain reaction

   d. Cloning

3. The first genetically modified organism (GMO) was created in the 1970s. What was it?

   a. Bacteria b. Mouse

   c. Corn d. Yeast

4. What is the function of restriction enzymes in genetic engineering?

   a. Copy DNA b. Cut DNA at specific sequences

   c. Amplify DNA d. Join DNA fragments

5. Which breakthrough allowed the automated sequencing of DNA, significantly advancing genetic engineering?

   a. Polymerase chain reaction (PCR)

   b. DNA fingerprinting

   c. Human Genome Project

   d. Sanger sequencing

6. The development of CRISPR-Cas9 technology revolutionized genetic engineering. What does CRISPR stand for?

   a. Clustered Regularly Interspaced Short Palindromic Repeats

   b. Comprehensive Replication of Integrated Sequences

   c. Cellular Reprogramming through Integrated Sequences

   d. Chromosomal Regulation in Integrated Splicing Processes

7. In which year was the CRISPR-Cas9 gene editing system first demonstrated in human cells?

   a. 2005 b. 2012

   c. 1998 d. 1983

8. What is the primary role of ligase in genetic engineering?

   a. Cut DNA at specific sequences

   b. Join DNA fragments

   c. Copy DNA

   d. Amplify DNA

9. The term "gene cloning" refers to what process in genetic engineering?

   a. Copying entire genomes

   b. Replicating genes in a laboratory setting

   c. Creating hybrid organisms

   d. Inserting genes into plasmids

10. Which of the following is NOT a potential application of genetic engineering?

    a. Disease treatment b. Agricultural crop improvement

    c. Space travel d. Environmental cleanup

11. What was the first genetically engineered product approved for human use?

    a. Genetically modified tomatoes b. Insulin

    c. Recombinant growth hormone d. Golden Rice

12. Which Nobel laureate was involved in the development of the polymerase chain reaction (PCR)?

    a. James Watson b. Kary Mullis

    c. Francis Crick d. Barbara McClintock

13. What is the purpose of gel electrophoresis in genetic engineering?

    a. Amplify DNA

    b. Separate and analyze DNA fragments

    c. Cut DNA at specific sequences

    d. Join DNA fragments

14. What is the name of the technique used to introduce foreign genes into plant cells?

    a. Gene therapy

    b. Polymerase chain reaction

    c. Agrobacterium-mediated transformation

    d. Southern blotting

15. In the context of genetic engineering, what does the term "transgenic" mean?

    a. Genetically identical

    b. Genetically modified with genes from another species

    c. Genetically resistant to diseases

    d. Genetically engineered for longevity

16. Which organization led the Human Genome Project, mapping the entire human genome?

    a. European Space Agency (ESA)

    b. National Aeronautics and Space Administration (NASA)

    c. National Institutes of Health (NIH)

    d. World Health Organization (WHO)

17. What is the purpose of reverse transcriptase in genetic engineering?

    a. Amplify DNA b. Synthesize RNA from DNA

    c. Join DNA fragments d. Cut DNA at specific sequences

18. Which of the following is a potential ethical concern associated with genetic engineering?

    a. Enhanced disease resistance in crops

    b. Gene therapy for genetic disorders

    c. Cloning for organ transplantation

    d. Improved vaccines

19. What is the significance of the "Dolly the sheep" experiment in genetic engineering?

a. First successful gene therapy in humans

b. First genetically modified plant

c. First cloned mammal

d. First use of CRISPR-Cas9 in humans

20. What does the term "pharming" refer to in the context of genetic engineering?

a. Growing crops in a pharmaceutical laboratory

b. Engineering plants to produce pharmaceuticals

c. Creating hybrid organisms for medical research

d. Cloning farm animals for increased productivity

21. What is the primary role of a vector in genetic engineering?

a. Cut DNA at specific sequences

b. Join DNA fragments

c. Amplify DNA

d. Carry foreign DNA into a host cell

22. What is the name of the process by which DNA fragments are amplified in vitro using a heat-stable polymerase enzyme?

a. Gel electrophoresis b. Southern blotting

c. Polymerase chain reaction (PCR) d. DNA sequencing

23. Which enzyme is responsible for synthesizing complementary DNA (cDNA) from mRNA in genetic engineering?

a. Restriction enzyme b. Ligase

c. Reverse transcriptase d. DNA polymerase

24. What is the primary goal of genetic engineering?

a. To create new species

b. To modify genetic material

c. To control weather patterns

d. To study ancient civilizations

25. Which of the following is an application of genetic engineering in agriculture?

a. Smartphone development b. Antibiotic production

c. Crop improvement d. Solar energy research

26. What is recombinant DNA technology used for in genetic engineering?

a. Cloning humans

b. Creating hybrid animals

c. Combining DNA from different sources

d. Studying ancient fossils

27. Which enzyme is commonly used to cut DNA at specific sequences in genetic engineering?

a. Amylase b. Ligase

c. Restriction enzyme d. Helicase

28. In gene therapy, what is the main objective?

a. Creating designer babies

b. Curing genetic disorders by replacing or repairing faulty genes

c. Enhancing physical abilities

d. Developing new cosmetic products

29. What is CRISPR-Cas9 commonly used for in genetic engineering?

a. Cooking b. Editing genes

c. Generating electricity d. Producing vaccines

30. Which of the following is an example of genetically modified organism (GMO) in medicine?

a. Fluorescent cats b. Electric eels

c. Talking parrots d. Giant pandas

31. What is the significance of transgenic organisms in genetic engineering?

a. They can survive in outer space

b. They contain genes from multiple species

c. They produce unlimited energy

d. They are resistant to all diseases

32. Which disease has been successfully treated using gene therapy?

a. Influenza b. Cystic fibrosis

c. Malaria d. Common cold

33. What role do plasmids play in genetic engineering?

a. Transmitting electrical signals

b. Carrying genetic material

c. Filtering water

d. Producing oxygen

34. What is the purpose of gene cloning in genetic engineering?

    a. Creating identical organisms

    b. Developing new species

    c. Extracting ancient DNA

    d. Generating nuclear energy

35. Which of the following is an environmental application of genetic engineering?

    a. Cloning extinct species b. Bioremediation

    c. Moon colonization d. Building underwater cities

36. What is the primary ethical concern associated with genetic engineering in humans?

    a. Lack of funding b. Loss of biodiversity

    c. Privacy issues d. Playing with the human germline

37. Which technology allows scientists to read the sequence of DNA bases in a genome?

    a. X-ray crystallography

    b. Polymerase chain reaction (PCR)

    c. DNA sequencing

    d. Electron microscopy

38. In agriculture, what is the purpose of creating herbicide-resistant crops using genetic engineering?

    a. To kill all plants in the field

    b. To increase the use of herbicides

    c. To reduce the need for herbicides

d. To attract more insects

39. Which of the following is a potential benefit of genetic engineering in medicine?

a. Increased sugar production

b. Enhanced athletic performance

c. Personalized medicine

d. Improved weather forecasting

40. What is the main advantage of using genetically modified bacteria in the production of insulin?

a. Lower cost b. Higher sugar content

c. Faster reproduction d. Greater taste

41. What is the role of RNA interference (RNAi) in genetic engineering?

a. Enhancing smell perception

b. Regulating gene expression

c. Transmitting electrical signals

d. Filtering toxins from the air

42. What is the primary aim of creating genetically modified (GM) crops with increased nutritional content?

a. Attracting more insects

b. Reducing shelf life

c. Improving human nutrition

d. Enhancing color

43. Which technology is used to introduce foreign genes into plant cells in genetic engineering?

a. Nuclear fission

b. Polymerase chain reaction (PCR)

c. Electrophoresis

d. Agrobacterium-mediated transformation

44. What is the potential drawback of gene editing technologies like CRISPR-Cas9?

a. Unlimited energy production

b. Off-target effects

c. Enhanced human intelligence

d. Increased lifespan

45. Which of the following is an example of a genetically modified animal used in scientific research?

a. Talking parrots b. Glowing jellyfish

c. Giant pandas d. Electric eels

46. What is the purpose of creating insect-resistant crops using genetic engineering in agriculture?

a. To attract more insects

b. To reduce the need for pesticides

c. To increase soil fertility

d. To control weather patterns

47. Which enzyme is responsible for joining DNA fragments in recombinant DNA technology?

a. Restriction enzyme

b. DNA ligase

c. Polymerase chain reaction (PCR)

d. Helicase

48. What is the primary advantage of using gene editing technologies in livestock breeding?

a. Decreased reproductive efficiency

b. Increased susceptibility to diseases

c. Enhanced traits in desired offspring

d. Lower meat quality

49. What is the primary function of endonucleases?

a. RNA synthesis b. DNA cleavage

c. Protein synthesis d. Lipid digestion

50. Which of the following is a characteristic feature of endonucleases?

a. Acts only at the ends of DNA

b. Recognizes and cleaves specific DNA sequences

c. Always requires ATP for activity

d. Primarily involved in DNA replication

51. Which type of endonuclease is responsible for repairing damaged DNA?

a. Restriction endonuclease b. DNA ligase

c. Exonuclease d. Repair endonuclease

52. Which of the following is NOT a type of restriction endonuclease?

a. EcoRI b. TaqI

c. DNA polymerase d. HindIII

53. How do restriction endonucleases protect bacterial cells from foreign DNA invasion?

a. They inhibit DNA replication

b. They methylate their own DNA

c. They degrade foreign DNA

d. They repair damaged DNA

54. Which of the following organisms is a common source of restriction endonucleases?

a. Human b. Bacteria

c. Fungi d. Plants

55. What is the significance of palindromic sequences in the context of restriction endonucleases?

a. They are the recognition sites for endonucleases

b. They inhibit the activity of endonucleases

c. They are resistant to endonuclease cleavage

d. They promote DNA synthesis

56. Which of the following processes involves the use of endonucleases?

a. Translation b. Transcription

c. DNA replication d. Post-translational modification

57. Which endonuclease is commonly used in the polymerase chain reaction (PCR) technique?

a. EcoRI b. TaqI

c. HindIII d. NotI

58. What is the role of endonucleases in the CRISPR-Cas9 system?

a. RNA transcription b. DNA cleavage

c. Protein synthesis d. DNA methylation

59. What is the primary function of exonuclease enzymes?

a. Synthesizing DNA

b. Degrading DNA from the ends

c. Repairing DNA damage

d. Transcribing RNA

60. Which type of exonuclease is involved in proofreading during DNA replication?

a. 3' to 5' exonuclease b. 5' to 3' exonuclease

c. RNA exonuclease d. Endonuclease

61. Which exonuclease enzyme is responsible for degrading RNA primers during DNA replication?

a. DNA polymerase I b. DNA polymerase III

c. RNase H d. Ligase

62. What is the role of 3' to 5' exonuclease activity in DNA polymerases?

a. Adding nucleotides to the growing DNA strand

b. Removing misincorporated nucleotides

c. Sealing nicks in the DNA backbone

d. Initiating DNA replication

63. Which exonuclease enzyme is involved in the repair of DNA mismatches?

a. Exonuclease I b. Exonuclease II

c. MutS d. MutL

64. In DNA repair, which exonuclease participates in the removal of damaged DNA segments?

a. Exonuclease III b. Exonuclease IV

c. Exonuclease V d. Exonuclease VI

65. Which exonuclease is responsible for processing the 5' ends of DNA fragments during DNA repair?

a. Exonuclease I b. Exonuclease VII

c. Exonuclease X d. Exonuclease Y

66. Which exonuclease is involved in the degradation of single-stranded DNA in the 3' to 5' direction?

a. Exonuclease X b. Exonuclease Y

c. Exonuclease Z d. Exonuclease W

67. What is the primary function of the 5' to 3' exonuclease activity in DNA polymerases?

a. Initiating DNA replication

b. Repairing DNA damage

c. Proofreading during replication

d. Synthesizing RNA primers

68. Which exonuclease enzyme is involved in the degradation of single-stranded DNA in the 5' to 3' direction?

a. Exonuclease W b. Exonuclease X

c. Exonuclease Y d. Exonuclease Z

69. In the process of nucleotide excision repair, which exonuclease is responsible for removing the damaged DNA segment?

a. Exonuclease I b. Exonuclease II

c. Exonuclease III d. Exonuclease IV

70. Which exonuclease is involved in the degradation of DNA fragments with recessed 3' ends?

a. Exonuclease I b. Exonuclease II

c. Exonuclease IV d. Exonuclease V

71. Which exonuclease is responsible for processing Okazaki fragments during lagging strand synthesis?

a. Exonuclease I b. Exonuclease II

c. Exonuclease III d. Exonuclease IV

72. Which exonuclease participates in the degradation of RNA in RNA-DNA hybrids?

a. RNase H b. Exonuclease X

c. Exonuclease Y d. Exonuclease Z

73. In prokaryotes, which exonuclease enzyme is involved in the proofreading of DNA during replication?

a. DNA polymerase I b. DNA polymerase II

c. DNA polymerase III d. DNA polymerase IV

74. What is the primary function of ligase enzymes in molecular biology?

a. DNA replication b. DNA repair

c. Transcription d. Translation

75. Which type of bond is formed by ligase enzymes during their catalytic activity?

a. Peptide bond b. Glycosidic bond

c. Phosphodiester bond d. Hydrogen bond

76.In DNA replication, ligase is responsible for joining

a. Okazaki fragments b. RNA primers

c. Helicase d. DNA polymerase

77.Ligase enzymes are essential for the formation of a continuous strand during DNA replication on the:

a. Leading strand b. Lagging strand

c. Template strand d. Promoter region

78. Which of the following ligase enzymes is involved in eukaryotic DNA replication?

a. DNA ligase I b. DNA ligase III

c. DNA ligase IV d. DNA ligase Prok

79. DNA ligases use what molecule as a co-factor during the ligation reaction?

a. ATP b. GTP

c. CTP d. UTP

80. In which phase of the cell cycle is DNA repair involving DNA ligase most active?

a. G1 phase b. S phase

c. G2 phase d. M phase

81. Which of the following is a characteristic feature of DNA ligase?

a. 3' to 5' exonuclease activity

b. 5' to 3' polymerase activity

c. Ligating single-stranded DNA ends

d. Unwinding double-stranded DNA

82. DNA ligase is commonly used in genetic engineering for

a. DNA amplification b. DNA sequencing

c. DNA ligation d. DNA denaturation

83. Which of the following is a bacterial DNA ligase commonly used in recombinant DNA technology?

a. T4 DNA ligase b. DNA ligase I

c. DNA ligase III d. Ligase Prokaryotes

84. Question:In the process of DNA repair, ligase is essential for sealing breaks in the:

a. Major groove b. Minor groove

c. Sugar-phosphate backbone d. Nitrogenous bases

85.Which enzyme is responsible for removing RNA primers during DNA replication, allowing DNA ligase to fill the gaps?

a. DNA polymerase I b. DNA helicase

c. DNA ligase III d. RNA polymerase

86. The function of ligase can be described as:

a. Breaking DNA strands b. Unwinding DNA helix

c. Joining DNA fragments d. Initiating DNA synthesis

87. Ligase enzymes are crucial for the final step in the formation of:

a. mRNA b. tRNA

c. rRNA d. DNA

88. Which of the following is a viral DNA ligase commonly used in molecular biology techniques?

a. T4 DNA ligase b. DNA ligase I

c. DNA ligase III d. Ligase Prok

89. What is the primary function of DNA polymerase?

a. RNA synthesis b. DNA synthesis

c. Protein synthesis d. Lipid synthesis

90. Which type of DNA polymerase is responsible for synthesizing the majority of the DNA during DNA replication in eukaryotic cells?

a. DNA Polymerase I b. DNA Polymerase II

c. DNA Polymerase III d. DNA Polymerase δ

91. In prokaryotes, which DNA polymerase is involved in DNA repair and has 3' to 5' exonuclease activity?

a. DNA Polymerase I b. DNA Polymerase II

c. DNA Polymerase III d. DNA Polymerase δ

92. Which domain of DNA polymerase is responsible for catalyzing the formation of phosphodiester during DNA synthesis?

a. Exonuclease domain b. Polymerase domain

c. Helicase domain d. Primase domain

93.Which DNA polymerase is known for its role in repairing DNA damage caused by ultraviolet (UV) light?

a. DNA Polymerase I b. DNA Polymerase II

c. DNA Polymerase III d. DNA Polymerase η

94. Which exonuclease activity is associated with the proofreading function of DNA polymerase?

a. 3' to 5' b. 5' to 3'

c. 2' to 4' d. 1' to 6

95. Which DNA polymerase is responsible for replicating the mitochondrial DNA?

a. DNA Polymerase I b. DNA Polymerase II

c. DNA Polymerase γ d. DNA Polymerase

96. Which DNA polymerase is involved in the synthesis of the RNA primer during DNA replication?

a. DNA Polymerase I b. DNA Polymerase II

c. DNA Polymerase III d. Primase

97. What is the role of the sliding clamp in DNA replication?

a. Unwinding DNA strands

b. Synthesizing RNA primers

c. Stabilizing the interaction between DNA polymerase and template DNA

d. Proofreading DNA

98. Which DNA polymerase is involved in translation DNA synthesis and can replicate past damaged DNA?

a. DNA Polymerase I b. DNA Polymerase I

c. DNA Polymerase d. DNA Polymerase

99. Which DNA polymerase is essential for the synthesis of the lagging strand in DNA replication

a. DNA Polymerase I b. DNA Polymerase I

c. DNA Polymerase II d. DNA Polymerase α

100. Which of the following is a high-fidelity DNA polymerase often used in polymerase chain reaction (PCR)?

a. Taq polymerase b. DNA Polymerase I

c. DNA Polymerase II d. RNA polymerase

101. Which DNA polymerase is involved in the repair of DNA double-strand breaks by non-homologous end joining?

a. DNA Polymerase I b. DNA Polymerase II

c. DNA Polymerase δ d. DNA Polymerase μ

102. In which phase of the cell cycle is DNA polymerase actively involved in replicating the genome?

a. G1 phase b. S phase

c. G2 phase d. M phase

103. Which DNA polymerase is responsible for repairing DNA mismatches during DNA replication?

a. DNA Polymerase I b. DNA Polymerase II

c. DNA Polymerase III d. DNA Polymerase δ

104. Which DNA polymerase is sensitive to the presence of ribonucleotides and is involved in their removal during DNA replication?

a. DNA Polymerase I b. DNA Polymerase II

c. DNA Polymerase δ d. RNase H

105. What is the main role of DNA polymerase III in bacterial DNA replication?

a. Lagging strand synthesis

b. Leading strand synthesis

c. DNA repair

d. Proofreading

106. Which DNA polymerase is responsible for synthesizing the Okazaki fragments during lagging strand synthesis?

a. DNA Polymerase I b. DNA Polymerase II

c. DNA Polymerase III d. DNA Polymerase α

107. Which DNA polymerase is involved in the repair of DNA damage caused by reactive oxygen species?

a. DNA Polymerase I b. DNA Polymerase II

c. DNA Polymerase δ d. DNA Polymerase β

108. Which exonuclease activity is associated with the removal of RNA primers during DNA replication?

a. 3' to 5' b. 5' to 3'

c. 2' to 4' d. 1' to 6'

109. Which DNA polymerase is responsible for replicating the telomeres at the ends of linear chromosomes?

a. DNA Polymerase I b. DNA Polymerase II

c. Telomerase d. DNA Polymerase γ

110. What is the primary function of RNA polymerase?

a. DNA replication b. Protein synthesis

c. RNA synthesis d. Cell division

111. Which type of RNA is synthesized by RNA polymerase?

a. mRNA b. tRNA

c. rRNA d. All of the above

112. In prokaryotes, which RNA polymerase is responsible for transcribing most genes?

a. RNA Polymerase I b. RNA Polymerase II

c. RNA Polymerase III d. RNA Polymerase holoenzyme

113.Which subunit of RNA polymerase is responsible for recognizing the promoter sequence in prokaryotes?

a. α subunit b. β subunit

c. σ subunit d. δ subunit

114. In eukaryotes, which RNA polymerase is responsible for transcribing protein-coding genes?

a. RNA Polymerase I b. RNA Polymerase II

c. RNA Polymerase III d. RNA Polymerase IV

115. Which of the following is true regarding RNA polymerase during transcription?

a. It moves in the 5' to 3' direction along the template strand

b. It synthesizes RNA in the 3' to 5' direction

c. It requires a primer to initiate transcription

d. It has proofreading activity

116. The process of transcription termination in prokaryotes often involves the formation of----

a. Hairpin loop b. Okazaki fragments

c. Telomeres d. Exons

117. Which of the following is not a component of the transcription initiation complex in eukaryotes?

a. TATA box b. Transcription factors

c. Shine-Dalgarno sequence d. RNA Polymerase II

118. What is the role of the TATA box in eukaryotic transcription?

a. It acts as a termination signal

b. It is the start codon for translation

c. It serves as a promoter element

d. It stabilizes the mRNA molecule

119. Which type of transcriptional regulation involves the binding of a repressor protein to the operator region?

a. Positive regulation b. Negative regulation

c. Enhancer regulation d. Activator regulation

120. In eukaryotes, the C-terminal domain (CTD) of RNA Polymerase II undergoes phosphorylation. What is its significance?

a. It helps in transcription initiation

b. It is involved in transcriptional elongation

c. It aids in transcriptional termination

d. It is essential for proofreading

121. Which of the following is responsible for synthesizing ribosomal RNA (rRNA) in eukaryotes?

a. RNA Polymerase I b. RNA Polymerase II

c. RNA Polymerase III d. RNA Polymerase IV

122. During transcription, what is the purpose of the consensus sequence in the promoter region?

a. Initiates translation

b. Marks the start codon

c. Attracts RNA polymerase to the promoter

d. Marks the stop codon

123. Which enzyme is responsible for removing the RNA primer during DNA replication?

a. DNA ligase b. DNA helicase

c. RNA polymerase d. DNA primase

124. In which cellular compartment does transcription take place in eukaryotes?

a. Nucleus b. Cytoplasm

c. Mitochondria d. Endoplasmic reticulum

125. What is the function of the terminator sequence in transcription?

a. Initiates transcription

b. Marks the start codon

c. Signals the end of transcription

d. Enhances transcriptional elongation

126. Which of the following is NOT a step in transcription initiation in prokaryotes?

a. Binding of RNA polymerase to the promoter

b. Formation of the transcription bubble

c. Synthesis of RNA

d. Recognition of the promoter sequence

127. Which type of RNA is involved in carrying amino acids to the ribosome during protein synthesis?

a. mRNA b. rRNA

c. tRNA d. snRNA

128. What is the function of RNA polymerase II in eukaryotic cells?

a. Synthesizes mRNA b. Synthesizes rRNA

c. Synthesizes tRNA d. Synthesizes all types of RNA

129. In eukaryotes, which region of the gene contains non-coding sequences that are transcribed but not translated?

a. Promoter b. Exon

c. Intron d. Codon

130. Which of the following is a characteristic feature of RNA polymerase?

a. Proofreading activity

b. 3' to 5' synthesis direction

c. Requires a primer for synthesis

d. Synthesizes DNA

131. Which subunit of RNA polymerase in prokaryotes is responsible for catalyzing the synthesis of RNA?

a. α subunit b. β subunit

c. σ subunit d. ω subunit

132. What is the purpose of the polyadenylation signal in eukaryotic mRNA?

a. Marks the start codon

b. Marks the stop codon

c. Facilitates splicing of introns

d. Adds a poly-A tail

133. What is the primary function of reverse transcriptase?

a. DNA replication b. RNA replication

c. RNA transcription d. DNA transcription

134. Which virus is commonly associated with reverse transcriptase activity?

a. Influenza virus

b. Herpes simplex virus

c. Human immunodeficiency virus (HIV)

d. Hepatitis B virus

135. Reverse transcriptase converts RNA into

a. DNA b. RNA

c. Proteins d. Lipids

136.Which of the following is a characteristic feature of reverse transcriptase?

a. 5' to 3' DNA synthesis

b. 3' to 5' RNA synthesis

c. Template-independent synthesis

d. Exonuclease activity

137. In the life cycle of retroviruses, reverse transcriptase is involved in the conversion of-----

a. DNA to RNA b. RNA to DNA

c. RNA to proteins d. Proteins to RNA

138. Which enzyme works in conjunction with reverse transcriptase to integrate viral DNA into the host genome?

a. DNA ligase b. DNA polymerase

c. Integrase d. RNA polymerase

139. The process catalyzed by reverse transcriptase is essential for the replication of

a. Bacteria b. Archaea

c. Eukaryotes d. Retroviruses

140. Reverse transcriptase inhibitors are commonly used in the treatment of infections caused by

a. Bacteria b. Fungi

c. Viruses d. Protozoa

141. Which of the following is an example of a reverse transcriptase inhibitor used in HIV treatment?

a. Penicillin b. Acyclovir

c. Zidovudine (AZT) d. Ciprofloxacin

142. The reverse transcription process involves the synthesis of a complementary DNA strand using a

a. RNA template b. Protein template

c. DNA template d. Lipid template

143. Reverse transcriptase is a key enzyme in the replication of

a. DNA viruses b. RNA viruses

c. Prions d. Viroids

144. Which of the following is NOT a function of reverse transcriptase?

a. RNA degradation

b. RNA-dependent DNA synthesis

c. DNA-dependent DNA synthesis

d. RNase H activity

145. The term "retro" in retrovirus refers to

a. Reverse transcription b. RNA degradation

c. Replication speed d. Reverse translation

146. Which type of reverse transcriptase is commonly found in retroviruses?

a. Cellular reverse transcriptase

b. Telomerase

c. Viral reverse transcriptase

d. Mitochondrial reverse transcriptase

147. The enzyme that degrades the RNA strand in the RNA-DNA hybrid during reverse transcription is called

a. RNA polymerase b. DNA ligase

c. RNase H d. DNA helicase

148. Which of the following is a characteristic feature of reverse transcriptase during DNA synthesis?

a. Template-dependent synthesis

b. Synthesis in the 3' to 5' direction

c. Synthesis of both strands simultaneously

d. Lack of proofreading activity

149. What is the role of tRNA in reverse transcription?

a. Template for DNA synthesis

b. Primer for DNA synthesis

c. Ribosomal subunit

d. mRNA template

150. The activity of reverse transcriptase is crucial for the replication of

a. DNA to DNA b. RNA to RNA

c. DNA to RNA d. RNA to protein

151. Which of the following is NOT a type of reverse transcriptase?

a. Telomerase

b. Viral reverse transcriptase

c. Mitochondrial reverse transcriptase

d. RNA polymerase

152. During reverse transcription, the initial step is the binding of reverse transcriptase to

a. DNA primer b. RNA primer

c. mRNA template d. tRNA template

153. The enzyme responsible for adding DNA sequences to the ends of eukaryotic chromosomes is

a. Reverse transcriptase b. DNA polymerase

c. RNA polymerase d. Telomerase

154.Which of the following is a potential application of reverse transcriptase in molecular biology?

a. DNA sequencing

b. RNA interference

c. Polymerase chain reaction (PCR)

d. Gene cloning

155.What is the primary function of reverse transcriptase in the context of telomeres?

a. Telomere extension b. Telomere shortening

c. Telomere degradation d. Telomere repair

156. Inhibitors of reverse transcriptase are commonly used as antiviral drugs in the treatment of infections caused by

a. Bacteria b. Fungi

c. Retroviruses d. Protozoa

157. Which of the following is a major challenge in the development of drugs targeting reverse transcriptase?

a. Lack of specificity

b. Rapid degradation in vivo

c. High cost of production

d. Resistance mutations

158. What is the primary function of DNases in a cell?

a. RNA degradation b. DNA replication

c. Protein synthesis d. DNA degradation

159. Which type of DNase is responsible for degrading extracellular DNA in bacterial biofilms?

a. DNase I b. DNase II

c. DNase III d. DNase IV

160. In which cellular compartment is DNase II predominantly active?

a. Nucleus b. Cytoplasm

c. Endoplasmic reticulum d. Lysosome

161. What is the optimum pH range for DNase I activity?

a. Acidic (pH 4-6) b. Neutral (pH 7)

c. Alkaline (pH 8-9) d. Variable pH

162. DNase II is involved in the degradation of DNA from which source?

a. Nuclear DNA b. Mitochondrial DNA

c. Extracellular DNA d. Ribosomal DNA

163.Which of the following is a non-specific endonuclease?

a. DNase I b. DNase II

c. DNase III d. DNase IV

164.What is the primary structure of DNase IIIq?

a. Single-stranded RNA b. Single-stranded DNA

c. Double-stranded RNA d. Double-stranded DNA

165. Which enzyme is responsible for removing RNA primers during DNA replication?

a. DNase I b. DNase II

c. RNase H d. Exonuclease

166. DNase IV is also known as

a. Exonuclease b. Apoptotic endonuclease

c. Replicative helicase d. RNA polymerase

167. Which DNase is involved in the degradation of fragmented DNA during apoptosis?

a. DNase I b. DNase II

c. DNase III d. DNase IV

168.Which metal ion is essential for the activity of DNase I?

a. Magnesium (Mg2+) b. Calcium (Ca2+)

c. Potassium (K+) d. Iron (Fe2+)

169.DNase II is activated in response to

a. DNA damage b. Viral infection

c. Lysosomal acidification d. Cellular stress

170. What is the primary substrate for DNase III?

a. Single-stranded RNA b. Single-stranded DNA

c. Double-stranded RNA d. Double-stranded DNA

171. Which DNase is involved in the repair of double-strand breaks in DNA?

a. DNase I b. DNase II

c. DNase III d. DNase IV

172.What is the primary function of DNase IV during apoptosis?

a. DNA repair b. DNA degradation

c. RNA synthesis d. Protein degradation

173. Which DNase is responsible for the fragmentation of chromosomal DNA into nucleosome-sized fragments during apoptosis?

a. DNase I b. DNase II

c. DNase III d. DNase IV

174. DNase I is inhibited by

a. Metal ions b. Chelating agents

c. Nucleotides d. DNA binding proteins

175. DNase II is activated in the presence of

a. Mg^{2+} b. Ca^{2+}

c. Zn^{2+} d. Na^{+}

176. Which DNase is involved in the degradation of RNA/DNA hybrids?

a. DNase I b. DNase II

c. RNase H d. DNase IV

177. What is the primary function of DNase IV during non-apoptotic cellular processes?

a. DNA repair b. DNA degradation

c. RNA synthesis d. Protein degradation

178. Which DNase is essential for the removal of supercoiling ahead of the DNA replication fork?

a. DNase I b. DNase II

c. Topoisomerase I d. Topoisomerase II

179. DNase III is also known as

a. Endonuclease G b. Exonuclease I

c. Exonuclease III d. Endonuclease I

180.Which DNase is involved in the degradation of DNA in apoptotic bodies?

a. DNase I b. DNase II

c. DNase III d. DNase IV

181.DNase IV is implicated in

a. DNA replication b. DNA repair

c. Apoptosis d. RNA synthesis

182.Which type of DNase is predominantly found in the mitochondrial matrix?

a. DNase I b. DNase II

c. Mitochondrial DNase d. Endonuclease G

183.What is the primary function of S1 nuclease?

a. DNA replication b. RNA transcription

c. DNA repair d. Single-stranded DNA digestion

184.S1 nuclease is an enzyme that specifically cleaves

a. Double-stranded DNA b. Single-stranded DNA

c. RNA d. Both a and c

185.S1 nuclease is commonly used in molecular biology for

a. DNA amplification b. DNA sequencing

c. RNA interference d. DNA hybridization studies

186.Which of the following is a source of S1 nuclease?

a. Bacteria b. Fungi

c. Animals d. Plants

187.S1 nuclease is essential in studying

a. Protein structure b. Gene expression

c. Cellular respiration d. Photosynthesis

188.In which type of DNA structure does S1 nuclease function most effectively?

a. Single-stranded DNA b. Double-stranded DNA

c. Triple-stranded DNA d. Quadruple-stranded DNA

189.S1 nuclease activity is inhibited by

a. Ethidium bromide b. EDTA

c. DTT (Dithiothreitol) d. ATP (Adenosine triphosphate)

190.The S1 nuclease enzyme is commonly used to generate

a. DNA fragments b. RNA fragments

c. Protein fragments d. Lipid fragments

191.S1 nuclease is involved in the removal of

a. Introns b. Exons

c. Telomeres d. Promoters

192. S1 nuclease cleaves phosphodiester bonds between

a. Deoxyribose and phosphate

b. Adenine and thymine

c. Guanine and cytosine

d. Ribose and phosphate

193. S1 nuclease is often used in the analysis of

a. Proteins b. Lipids

c. Nucleic acids d. Carbohydrates

194.What is the optimal pH for S1 nuclease activity?

a. Acidic b. Neutral

c. Alkaline d. Extremely alkaline

195.Which of the following conditions enhances S1 nuclease activity?

a. High salt concentration b. Low temperature

c. Low pH d. Absence of divalent cation

196.S1 nuclease is particularly useful in studying

a. DNA replication b. DNA repair

c. RNA secondary structure d. Protein synthesis

197.S1 nuclease is classified as a

a. Protease b. Nuclease

c. Ligase d. Polymerase

198.The S1 nuclease enzyme was first isolated from

a. Escherichia coli b. Saccharomyces cerevisiae

c. Homo sapiens d. Arabidopsis thaliana

199. S1 nuclease is commonly used in the production of

a. Antibiotics b. Vaccines

c. Recombinant proteins d. Transgenic organisms

200.S1 nuclease is named after its activity on

a. Saturated DNA b. Single-stranded DNA

c. Synthesized DNA d. Spliced DNA

201.S1 nuclease is a part of which class of enzymes?

a. DNA ligase b. DNA helicase

c. DNA polymerase d. DNA exonuclease

202.Which metal ion is required for S1 nuclease activity?

a. Calcium b. Magnesium

c. Zinc d. Iron

203. S1 nuclease is involved in the removal of mismatched bases in

a. DNA replication b. DNA repair

c. RNA transcription d. Protein synthesis

204. In molecular biology, S1 nuclease is used to create

a. Complementary DNA (cDNA)

b. Restriction fragments

c. Genomic libraries

d. DNA fingerprints

205.S1 nuclease is most active at

a. Low temperatures b. Room temperature

c. High temperatures d. Extremely high temperatures

206.S1 nuclease is inhibited by

a. RNA b. DNA

c. Protein d. Lipid

207.The main application of S1 nuclease is in

a. Gene cloning b. DNA sequencing

c. RNA interference d. DNA digestion

208.What is the primary function of T4 polynucleotide kinase?

a. DNA replication b. RNA transcription

c. DNA repair d. Phosphorylation of nucleic acids

209. organism produces T4 polynucleotide kinase?

a. Escherichia coli b. Bacillus subtilis

c. Bacteriophage T4 d. Saccharomyces cerevisiae

210. T4 polynucleotide kinase catalyzes the transfer of phosphate groups to which nucleic acid molecule?

a. DNA b. RNA

c. Both DNA and RNA d. Proteins

211. What is the role of T4 polynucleotide kinase in DNA repair?

a. Excision repair

b. Base excision repair

c. Phosphorylation of damaged DNA ends

d. Mismatch repair

212.Which nucleotide is typically added by T4 polynucleotide kinase during phosphorylation?

a. Adenine b. Guanine

c. Thymine d. Phosphate

213. What is the significance of phosphorylating the 5' end of DNA or RNA by T4 polynucleotide kinase?

a. Stabilizes the nucleic acid structure

b. Facilitates ligation reactions

c. Enhances transcription efficiency

d. Prevents DNA replication

214.Which enzyme activity is associated with T4 polynucleotide kinase?

a. Ligase b. Helicase

c. Phosphatase d. Kinase

215.In which cellular process is T4 polynucleotide kinase commonly employed in molecular biology experiments?

a. PCR (Polymerase Chain Reaction)

b. DNA sequencing

c. Restriction digestion

d. DNA cloning

216. What is the optimal temperature for T4 polynucleotide kinase activity?

a. 37°C b. 50°C

c. 65°C d. 75°C

217.Which cofactor is required for T4 polynucleotide kinase activity?

a. ATP b. NAD+

c. Coenzyme A d. FAD

218.T4 polynucleotide kinase is often used in the labeling of DNA or RNA. What is labeled during this process?

a. 3' end b. 5' end

c. Both 3' and 5' ends d. Internal bases

219.Which of the following is a common application of T4 polynucleotide kinase in molecular biology?

a. DNA amplification b. RNA interference

c. DNA end-labeling d. Protein synthesis

220.What is the function of the T4 polynucleotide kinase in the T4 bacteriophage life cycle?

a. Replication of T4 genome

b. Integration into host genome

c. Repair of T4 DNA

d. Phosphorylation of host DNA

221.Which of the following is a characteristic feature of T4 polynucleotide kinase?

a. 3' to 5' exonuclease activity

b. 5' to 3' helicase activity

c. Phosphatase activity

d. DNA ligase activity

222.During the labeling of nucleic acids with T4 polynucleotide kinase, what is often used as a phosphoryl donor?

a. ATP b. GTP

c. UTP d. CTP

223. Which of the following is a method to inactivate T4 polynucleotide kinase after labeling reactions?

a. Heat inactivation b. Addition of EDTA

c. Proteinase K treatment d. All of the above

224.T4 polynucleotide kinase is involved in the modification of which end of DNA or RNA?

a. 3' end b. 5' end

c. Internal bases d. Both 3' and 5' ends

225.Which other enzyme is often used in conjunction with T4 polynucleotide kinase for the labeling of DNA or RNA ends?

a. DNA ligase b. Reverse transcriptase

c. RNA polymerase d. T4 DNA polymerase

226. What is the role of ATP in the phosphorylation reaction catalyzed by T4 polynucleotide kinase?

a. Phosphate donor b. Phosphate acceptor

c. Activator of enzyme d. Coenzyme

227.Which buffer is commonly used in T4 polynucleotide kinase reactions?

a. Tris-HCl b. Phosphate buffer

c. HEPES d. Tris-EDTA

228.In the absence of ATP, what is the effect on the activity of T4 polynucleotide kinase?

a. Enhanced activity b. Reduced activity

c. No effect d. Inhibition

229.What is the recommended storage condition for T4 polynucleotide kinase?

a. Room temperature b. 4°C

c. -20°C d. -80°

230.Which type of radiation is commonly used to visualize labeled nucleic acids in experiments involving T4 polynucleotide kinase?

a. X-rays b. UV light

c. Gamma rays d. Infrared radiation

231.What is the primary source of alkaline phosphatase in the body?

a. Liver b. Kidneys

c. Pancreas d. Lungs

232.Which of the following is a substrate for alkaline phosphatase?

a. ATP b. AMP

c. Phosphorylated proteins d. Phospholipids

233.In which tissue is alkaline phosphatase activity commonly found?

a. Muscle b. Bone

c. Nerve d. Blood

234. Elevated levels of alkaline phosphatase are often associated with which of the following conditions?

a. Liver disease b. Kidney failure

c. Bone disorders d. Respiratory infections

235.What is the optimal pH range for alkaline phosphatase activity?

a. Acidic b. Neutral

c. Slightly alkaline d. Highly alkaline

236.Which isoenzyme of alkaline phosphatase is most commonly associated with bone disorders?

a. ALP-1 b. ALP-2

c. ALP-3 d. ALP-4

237.Which vitamin is essential for normal alkaline phosphatase activity?

a. Vitamin A b. Vitamin B12

c. Vitamin C d. Vitamin D

238.Alkaline phosphatase is often measured in clinical laboratories as a marker for

a. Liver function b. Kidney function

c. Pancreatic function d. Cardiovascular health

239. What is the primary function of E. coli ligase?

a. DNA replication b. DNA repair

c. DNA transcription d. RNA splicing

240. Which of the following activities is characteristic of E. coli ligase?

a. DNA unwinding b. DNA ligation

c. RNA synthesis d. Protein translation

241. E. coli ligase is essential for the formation of which bond in DNA?

a. Glycosidic bond b. Phosphodiester bond

c. Hydrogen bond d. Peptide bond

242. What is the role of ATP in the ligation reaction catalyzed by E. coli ligase?

a. It provides energy for DNA unwinding

b. It activates the ligase enzyme

c. It promotes the formation of phosphodiester bonds

d. It serves as a substrate for DNA synthesis

243. What type of bonds does T4 DNA ligase form during the ligation process?

a. Phosphodiester bonds b. Hydrogen bonds

c. Glycosidic bonds d. Peptide bonds

244. Which of the following is a cofactor required for the activity of T4 DNA ligase?

a. ATP b. GTP

c. UTP d. CTP

245.T4 DNA ligase is commonly used in recombinant DNA technology. What is its role in this context?

a. Amplification of DNA

b. Joining DNA fragments with cohesive ends

c. Separation of DNA strands

d. RNA synthesis

246. T4 DNA ligase is derived from which type of bacteriophage?

a. Lambda phage b. T2 phage

c. T4 phage d. P22 phage

247. Which of the following is a feature of T4 DNA ligase that makes it useful in cloning applications?

a. High-fidelity polymerization

b. Temperature stability

c. Ability to join blunt-ended DNA fragments

d. RNA-binding activity

248. Which of the following is a commercial source of T4 DNA ligase?

a. Taq polymerase

b. EcoRI

c. Vent DNA polymerase

d. New England Biolabs (NEB)

249. What is the primary function of linkers in genetic engineering?

a. Enhance transcription

b. Facilitate DNA ligation

c. Inhibit translation

d. Regulate gene expression

250. Which enzyme is commonly used to ligate DNA fragments in genetic engineering?

a. DNA polymerase b. DNA ligase

c. RNA polymerase d. Reverse transcriptase

251. What is the role of linkers in the creation of recombinant DNA molecules?

a. Promote DNA replication

b. Join incompatible DNA ends

c. Enhance protein synthesis

d. Inhibit DNA transcription

252.Which of the following is a characteristic feature of linkers used in genetic engineering?

a. Short DNA sequences b. Large protein domains

c. RNA fragments d. Non-specific binding

253. In DNA cloning, what is the purpose of adding linkers to DNA fragments?

a. Increase DNA replication

b. Facilitate DNA purification

c. Enable directional cloning

d. Inhibit DNA degradation

254.Which type of linker is designed to create sticky ends for DNA fragments?

a. Blunt-ended linker b. Cohesive-ended linker

c. Random linker d. Non-specific linker

255.What is the significance of cohesive-ended linkers in genetic engineering?

a. They prevent self-ligation

b. They promote self-ligation

c. They inhibit DNA denaturation

d. They enhance PCR amplification

256.Which enzyme is responsible for cleaving DNA at specific recognition sites in the presence of linkers?

a. DNA polymerase b. Restriction endonuclease

c. DNA ligase d. Reverse transcriptase

257.In which step of the cloning process are linkers typically added to DNA fragments?

a. Transformation b. Ligation

c. Amplification d. Denaturation

258. What is the primary advantage of using linkers with restriction sites in cloning experiments?

a. Increased mutation rate b. Facilitates gene synthesis

c. Directional cloning d. Inhibits DNA replication

259.Which of the following is true about the use of linkers in shotgun sequencing?

a. Linkers are not used in shotgun sequencing

b. Linkers help assemble overlapping DNA fragments

c. Linkers inhibit DNA sequencing reactions

d. Linkers are only used in PCR amplification

260.What type of linker is often used to introduce mutations into specific regions of a gene?

a. Random linker b. Mutagenic linker

c. Non-specific linker d. Cohesive-ended linker

261. What is the purpose of a non-specific linker in genetic engineering?

a. Enhance DNA replication

b. Inhibit DNA ligation

c. Allow cloning of multiple fragments

d. Facilitate RNA transcription

262. In DNA libraries, what role do linkers play in facilitating the identification of specific genes?

a. Linkers promote gene silencing

b. Linkers enable DNA sequencing

c. Linkers allow for DNA denaturation

d. Linkers aid in the construction of chimeric genes

263.Which of the following linkers is commonly used for the construction of cDNA libraries?

a. Blunt-ended linker b. Adaptor linker

c. Mutagenic linker d. Random linker

264. What is the primary advantage of using adaptors as linkers in genetic engineering?

a. Increased specificity b. Enhanced stability

c. Directional cloning d. Inhibition of ligation

ANSWERS:

1.c,2,b,3.a,4.b,5.d,6.a,7.b,8.b,9.d,10.c,11.b,12.b,13.b,14.c,

15.b,16.c,17.b,18.c,19.c,20.b,21.d,22.c,23.c,24.b,25.c,26.c,

27.c,28.b,29.b,30.a,31.b,32.b,33.b,34.a,35.b,36.d,37.c,38.c,39.

c,40.a,41.b,42.c,43.d,44.b,45.b,46.b,47.b,48.c,49.b,50.b,51.d,5

2.c,53.c,54.b,55.a,56.c,57.b,58.b,59.b,60.b,61.c,62.b,63.a,64.a,

65.b,66.a,67.c,68.c,69.c,70.b,71.a,72.a,73.c,74.b,75.c,76.a,77.
d,78.a,79.a,80.b,81.c,82.c,83.a,84.c,85.a,86.c,87.d,88.c,89.b,9
0.d,91.a,92.b,93.d,94.a,95.c,96.d,97.c,98.c,99.d,100.a,
101.d,102.b,103.c,104.a,105.b,106.c,107.d,108.b,109.c,110.c,
111.d,112.d,113.c,114.b,115.a,116.a,117.c,118.c,119.b,120.b,
121.a,122.c,123.a,124.a,125.c,126.c,127.c,128.a,129.c,130.b,1
31.b,132.d,133.b,134.c,135.a,136.a,137.b,138.c,139.d,140.c,1
41.c,142.a,143.b,144.a,145.a,146.c,147.c,148.d,149.b,150.c,15
1.d,152.b,153.d,154.c,155.a,156.c,157.d,158.d,159.a,160.d,16
1.c,162.b,163.a,164.d,165.c,166.b,167.a,168.a,169.c,170.d,17
1.c,172.d,173.a,174.b,175.b,176.c,177.a,178.c,179.c,180.b,18
1.c,182.d,183.d,184.b,185.d,186.a,187.b,188.a,189.b,190.a,19
1.a,192.a,193.c,194.c,195.a,196.c,197.b,198.a,199.c,200.b,201
.d,202.b,203.b,204.a,205.b,206.a,207.a,208.d,209.c,210.c,211.
c,212.d,213.b,214.d,215.d,216.a,217.a,218.b,219.c,220.c,221.
c,222.a,223.d,224.b,225.a,226.a,227.b,228.d,229.c,230.b,231.
a,232.c,233.b,234.c,235.c,236.b,237.d,238.a,239.b,240.b,241.
b,242.c,243.a,244.a,245.b,246.c,247.c,248.d,249.b,250.b,251.
b,252.a,253.c,254.b,255.a,256.b,257.b,258.c,259.b,260.b,261.
c,262.b,263.b,264.c,

UNIT-II

1. What is a plasmid?
    a. Bacterial chromosome
    b. Viral DNA
    c. Circular extrachromosomal DNA
    d. Human mitochondrial DNA
2. Which of the following is a common feature of plasmids?
    a. Linear structure
    b. Double-stranded DNA
    c. Found only in eukaryotes
    d. Essential for bacterial survival
3. Plasmids are often used in genetic engineering for
    a. Energy production b. Recombinant DNA technology
    c. Cellular respiration d. Protein synthesis
4. What is the role of an origin of replication in a plasmid?
    a. Initiation of DNA replication
    b. Transcription of genes
    c. Protein synthesis
    d. DNA repair
5. Plasmids can carry genes that provide resistance to
    a. Antibiotics b. Viruses
    c. Fungi d. All of the above
6. In bacteria, plasmids are commonly transferred through

a. Mitosis b. Meiosis

c. Conjugation d. Binary fission

7.Which enzyme is involved in the process of plasmid DNA replication?

a. DNA ligase b. DNA polymerase

c. RNA polymerase d. Helicase

8. The ability of plasmids to replicate independently of the chromosomal DNA is due to

a. Telomeres b. Replication origin

c. Centromeres d. Plasmidase

9.What is the function of a selectable marker in a plasmid vector?

a. Initiates DNA replication

b. Allows for selection of transformed cells

c. Enhances protein synthesis

d. Inactivates antibiotics

10.Which of the following is a commonly used plasmid vector in genetic engineering?

a. p53 b. pUC19

c. mRNA d. tRNA

11. Plasmids can be classified based on their

a. Size b. Shape

c. Color d. Odor

12.The process by which a plasmid integrates into the bacterial chromosome is called

a. Transformation b. Transduction

c. Conjugation d. Translocation

13. Which of the following is a feature of high-copy-number plasmids?

a. Fewer copies per cell

b. High replication fidelity

c. Lower gene expression

d. More copies per cell

14.What is the primary advantage of using a shuttle vector?

a. It can shuttle between different hosts

b. It has a small size

c. It lacks antibiotic resistance

d. It cannot replicate autonomously

15.Plasmids carrying genes for bioluminescence are often used for

a. Medical imaging b. Environmental monitoring

c. Cancer therapy d. Gene therapy

16.What is the role of a reporter gene in plasmid vectors?

a. Confers antibiotic resistance

b. Facilitates selection of transformed cells

c. Produces a detectable product

d. Initiates DNA replication

17.Plasmids play a crucial role in the production of

a. Lipids b. Proteins

c. Carbohydrates d. Nucleic acids

18.Which of the following is an example of a low-copy-number plasmid?

a. pBR322 b. pUC19

c. F-plasmid d. R-plasmid

19.The process of introducing plasmid DNA into bacterial cells is called

a. Replication b. Transformation

c. Transduction d. Conjugation

20. Plasmids are commonly found in

a. Eukaryotic cells b. Prokaryotic cells

c. Plant cells d. Animal cells

21. What is the significance of an antibiotic resistance gene in a plasmid vector?

a. Enhances bacterial growth

b. Provides a means of selection

c. Inhibits plasmid replication

d. Promotes gene expression

22.Plasmids can be naturally found in

a. Animals b. Plants

c. Bacteria d. All of the above

23.Which type of plasmid carries genes that can integrate into the host genome?

a. Conjugative plasmid b. Integrative plasmid

c. Resistance plasmid d. Col plasmid

24.The process of curing a bacterial cell of its plasmid is called

a. Transformation b. Cytokinesis

c. Curing d. Lysis

25.Plasmids can be used to express foreign genes in bacteria through the use of

a. Transposons b. Promoters

c. Introns d. Enhancers

26.What type of molecule is pUC19?

a. Protein b. DNA

c. RNA d. Lipid

27.What is the size of the pUC19 plasmid in base pairs?

a. 2,000 bp b. 5,000 bp

c. 7,322 bp d. 10,000 bp

28.Which organism does pUC19 commonly originate from?

a. E. coli b. S. cerevisiae

c. H. sapiens d. D. melanogaster

29.pUC19 contains a high-copy-number origin of replication. What does "high-copy-number" refer to?

a. It replicates slowly

b. It can replicate in many copies per host cell

c. It only replicates once

d. It has a small size

30.What is the selectable marker in pUC19 often used for bacterial transformation?

a. Ampicillin resistance gene

b. Kanamycin resistance gene

c. Tetracycline resistance gene

d. Streptomycin resistance gene

31.What is the function of the Ampicillin resistance gene in pUC19?

a. Confers resistance to viral infection

b. Allows for blue-white screening

c. Allows the plasmid to be replicated in E. coli

d. Provides resistance to the antibiotic ampicillin

32.Which of the following is the correct full name for "pUC19"?

a. Plasmid Universal Carrier 19

b. pepsin Unit Cell 19

c. Plasmid of University of California 19

d. pBluescript Universal Cloning vector 19

33.What is the purpose of the multiple cloning site (MCS) in pUC19?

a. To insert a gene of interest

b. To replicate the plasmid

c. To express a reporter gene

d. To resist antibiotics

35.What is the typical color of colonies containing pUC19 after blue-white screening?

a. Blue b. White

c. Green d. Red

36.Which enzyme is commonly used to cut DNA and insert a gene into the MCS of pUC19?

a. DNA ligase b. Restriction endonuclease

c. RNA polymerase d. Reverse transcriptase

ANSWERS:

1.c,2,b,3.b,4.a,5.a,6.c,7.b,8.b,9.b,10.b,11.a,12.c,13.d,14.a,

15.b,16.c,17.b,18.c,19.b,20.b,21.b,22.b,23.c,24.b,25.c,26.b,

27.b,28.c,29.a,30.b,31.a,32.d,33.c,34.a,35.b,36.b

UNIT-III

1. In blue-white screening, what does a blue colony indicate?

a. Successful gene insertion

b. Unsuccessful gene insertion

c. The absence of ampicillin

d. The presence of a different plasmid

2 .What is the function of the lacZ gene in pUC19?

a. Confers antibiotic resistance

b. Encodes a restriction enzyme

c. Acts as a reporter gene

d. Initiates DNA replication

3.Which of the following is NOT a feature of pUC19?

a. Ampicillin resistance b. High-copy-number origin

c. Low molecular weight d. lacZ gene

4.What is the role of the PUC origin of replication in plasmid function?

a. Initiates transcription

b. Initiates translation

c. Initiates DNA replication

d. Confers antibiotic resistance

5.What is the purpose of using pUC19 in cloning experiments?

a. To express proteins

b. To create transgenic organisms

c. To amplify genes of interest

d. To study viral infection

6.Which of the following is an advantage of using pUC19 in cloning?

a. Low transformation efficiency

b. Lack of antibiotic resistance

c. High transformation efficiency

d. Small plasmid size

7.What is the significance of the term "pUC" in pUC19?

a. Plasmid for Universal Cloning

b. Polymerase Universal Carrier

c. Promoter Unit of California

d. Plasmid Under Construction

8.Which antibiotic is commonly used to select for pUC19 in bacterial cultures?

a. Tetracycline b. Kanamycin

c. Ampicillin d. Streptomycin

9.What is the purpose of the T7 promoter region in some pUC19 derivatives?

a. To initiate translation

b. To initiate transcription

c. To confer antibiotic resistance

d. To mark successful transformations

10.Which feature of pUC19 allows for easy identification of recombinant plasmids?

a. Multiple cloning site

b. Ampicillin resistance gene

c. lacZ gene

d. High-copy-number origin

11.What is the purpose of the polylinker region in the pUC19 multiple cloning site?

a. To facilitate PCR amplification

b. To allow for easy visualization

c. To insert genes of interest

d.To promote protein expression

12.What is pBR322?

a. A protein b. A plasmid

c. A PCR enzyme d. A restriction enzyme

13.pBR322 is commonly used in

a. Gene therapy

b. Polymerase chain reaction (PCR)

c. Recombinant DNA technology

d. Antibiotic production

14.pBR322 contains genes conferring resistance to which two antibiotics?

a. Ampicillin and tetracycline

b. Kanamycin and chloramphenicol

c. Ampicillin and chloramphenicol

d. Tetracycline and kanamycin

15.The pBR322 plasmid has how many antibiotic resistance genes?

a. One b. Two

c. Three d. Four

16. Which of the following is a selectable marker present in pBR322?

a. Green fluorescent protein (GFP)

b. LacZ

c. Ampicillin resistance gene

d. β-galactosidase

17.pBR322 is derived from:

a. Escherichia coli

b. Saccharomyces cerevisiae

c. Bacillus subtilis

d. Streptomyces griseus

18.Which of the following is not a feature of pBR322?

a. Origin of replication

b. Multiple cloning site (MCS)

c. Promoter for T7 RNA polymerase

d. Enhancer sequence

19.pBR322 is commonly used for

a. Genome sequencing

b. Gene cloning

c. Protein purification

d. RNA splicing

20.The pBR322 plasmid is named for its:

a. Discoverer b. Size

c. Resistance genes d. Purpose

21.The pBR322 plasmid is approximately how many base pairs long?

a. 2,000 b. 4,000

c. 6,000 d. 8,000

22. In pBR322, the ampicillin resistance gene is regulated by the

a. LacZ promoter b. Tet promoter

c. AmpR promoter d. T7 promoter

23.Which enzyme is used to cleave DNA at specific recognition sites in pBR322?

a. DNA ligase b. RNA polymerase

c. Restriction endonuclease d. DNA helicase

24. pBR322 has a unique restriction site for which restriction enzyme?

a. EcoRI b. BamHI

c.PstI d. HindIII

25. The pBR322 plasmid is commonly used for the construction of:

a. Genomic libraries b. RNA libraries

c. Protein libraries d. Lipid libraries

26.Which of the following is a characteristic of pBR322?

a. High-copy plasmid b. Low-copy plasmid

c. No-copy plasmid d. Circular RNA

27. pBR322 is often used as a vector for the expression of foreign genes under the control of which promoter?

a. T7 promoter b. LacZ promoter

c. AmpR promoter d. Tet promoter

28. What is the role of the multiple cloning site (MCS) in pBR322?

a. It allows for the insertion of multiple resistance genes

b. It facilitates the insertion of foreign DNA fragments

c. It regulates the replication of the plasmid

d. It codes for a selectable marker

29. Which of the following is NOT a component of pBR322?

a. OriV b. AmpR

c. TetR d. LacZ

30. pBR322 is classified as a:

a. Bacterial artificial chromosome (BAC)

b. Plasmid

c. Cosmid

d. Yeast artificial chromosome (YAC)

31. In pBR322, the lacZ gene encodes for:

a. Ampicillin resistance b. β-galactosidase

c. Tetracycline resistance d. DNA ligase

32. pBR322 was developed by:

a. Paul Berg b. Herbert Boyer

c. Stanley Cohen d. Richard J. Roberts

33. What is the function of the ampicillin resistance gene in pBR322?

a. It codes for a fluorescent protein

b. It allows for the selection of transformed cells

c. It regulates gene expression

d. It encodes a restriction enzyme

34. Which of the following is a feature of pBR322 that allows for easy identification of recombinant clones?

a. Multiple replication origins

b. Blue/white screening

c. High-copy number

d. Presence of a selectable marker

35.Which of the following is a bacteriophage commonly used as a vector in genetic engineering?

a. T4 Phage b. Lambda Phage

c. M13 Phage d. Adenovirus

36.What type of genetic material does Lambda Phage possess?

a. Single-stranded DNA b. Double-stranded RNA

c. Single-stranded RNA d. Double-stranded DNA

37. In Lambda Phage vectors, which region is replaced with foreign DNA for cloning purposes?

a. N gene b. O gene

c. P gene d. E gene

38. Which part of the Lambda Phage genome is responsible for recognizing and integrating into the E. coli genome?

a. cos site b. att site

c. rep site d. ori site

39. What is the function of the cI gene in Lambda Phage vectors?

a. Encodes for tail proteins

b. Regulates lysogeny

c. Initiates DNA replication

d. Encodes for capsid proteins

40. Which of the following is true regarding the cos site in Lambda Phage vectors?

a. It is responsible for integration into the host genome

b. It is a recognition site for restriction enzymes

c. It is a site for DNA replication initiation

d. It is involved in packaging the phage DNA into the capsid

41. Which of the following is a disadvantage of using Lambda Phage vectors in cloning?

a. Limited insert size

b. Unstable integration into the host genome

c. Difficulty in propagating the phage

d. Inability to infect E. coli cells

42.What is the term for the process by which Lambda Phage switches between the lytic and lysogenic cycles?

a. Transduction b. Conjugation

c. Lysogeny d. Transformation

43.Which of the following enzymes is commonly used to cleave Lambda Phage DNA at specific sites during cloning?

a. DNA ligase

b. Restriction endonuclease

c. RNA polymerase

d. DNA polymerase

44. What is the advantage of using Lambda Phage vectors for cloning large DNA fragments?

a. High transformation efficiency

b. Stable integration into the host genome

c. Large insert capacity

d. Rapid replication in host cells

45. What is the primary purpose of screening recombinant DNA?

a. To identify the host organism

b. To amplify the DNA

c. To isolate the recombinant DNA

d. To purify the plasmid

46. Which technique is commonly used for screening recombinant colonies?

a. Southern blotting b. PCR

c. Western blotting d. ELISA

47.In recombinant DNA technology, what is a selectable marker?

a. A gene that allows for easy visualization of colonies

b. A gene that confers resistance to an antibiotic or another agent

c. A gene that enhances protein expression

d. A gene that encodes for a fluorescent protein

48. What is the purpose of using a reporter gene in recombinant DNA technology?

a. To make the host organism visible under a microscope

b. To identify the presence of recombinant DNA

c. To enhance the expression of the target gene

d. To improve the stability of the plasmid

49. Which technique is commonly used for visualizing DNA fragments after electrophoresis?

a. PCR b. Southern blotting

c. Northern blotting d. Western blotting

50. What is blue-white screening commonly used for in recombinant DNA technology?

a. Identifying colonies with recombinant DNA

b. Identifying non-recombinant colonies

c. Enhancing protein expression

d. Amplifying the target gene

51. In the context of plasmid vectors, what does the term "ori" stand for?

a. Origin of replication b. Origin of recombination

c. Origin of restriction d. Origin of RNA

52. Which of the following is an example of a positive selectable marker?

a. LacZ gene b. Ampicillin resistance gene

c. GFP gene d. Tetracycline resistance gene

53.What is the purpose of colony PCR in recombinant DNA technology?

a. To amplify the entire plasmid

b. To amplify the target gene from bacterial colonies

c. To identify colonies with antibiotic resistance

d. To purify the plasmid DNA

54. Which method is used for introducing recombinant DNA into animal cells?

a. Transformation b. Transfection

c. Electroporation d. Conjugation

55. In DNA cloning, what is the purpose of the polylinker region in a plasmid vector?

a. It enhances the expression of the target gene

b. It allows for easy visualization of colonies

c. It provides multiple restriction enzyme sites for inserting DNA fragments

d. It acts as a selectable marker

56.Which of the following is a commonly used method for introducing foreign DNA into plant cells?

a. Electroporation

b. Microinjection

c. Agrobacterium-mediated transformation

d. Lipofection

57. What is the purpose of the kanamycin resistance gene in a plasmid vector?

a. It allows for easy visualization of colonies

b. It acts as a selectable marker

c. It enhances protein expression

d. It serves as a reporter gene

58. Which technique is used for detecting the presence of specific proteins in a sample?

a. Southern blotting b. Northern blotting

c. Western blotting d. Colony PCR

59.What is the purpose of a control vector in recombinant DNA experiments?

a. To serve as a negative control for PCR

b. To provide a baseline for comparing experimental results

c. To enhance the stability of the plasmid

d. To increase the expression of the target gene

60. In the context of recombinant DNA technology, what does the term "expression vector" refer to?

a. A vector used for introducing foreign DNA into host cells

b. A vector containing a promoter for driving the expression of the target gene

c. A vector with a selectable marker

d. A vector used for PCR amplification

61. Which enzyme is commonly used to cleave DNA at specific recognition sites in recombinant DNA technology?

a. DNA polymerase b. RNA polymerase

c. Restriction endonuclease d. Ligase

62.What is the purpose of blue-white screening in bacterial transformation?

a. To identify colonies with antibiotic resistance

b. To identify colonies with recombinant DNA

c. To enhance protein expression

d. To amplify the target gene

63. Which of the following is an example of a negative selectable marker?

a. GFP gene b. LacZ gene

c. Ampicillin resistance gene d. Thymidine kinase gene

64. What is the purpose of heat shock in bacterial transformation?

a. To kill non-transformed cells

b. To promote the expression of the target gene

c. To increase the efficiency of plasmid uptake by cells

d. To degrade unwanted DNA

65. Which technique is used to separate and analyze proteins based on their size?

a. PCR b. Gel electrophoresis

c. Western blotting d. Southern blotting

66. What does pCR stand for?

a. Polymerase Copy Reaction

b. Polymerization Chain Reaction

c. Polymerase Chain Reaction

d. Polymerase Catalysis Reaction

67. Which enzyme is commonly used in pCR to amplify DNA?

a. RNA polymerase b. DNA ligase

c. DNA polymerase d. Reverse transcriptase

68. Which of the following is not a type of pCR?

a. RT-PCR b. qPCR

c. ddPCR d. mRNA-PCR

c. Multiplex PCR d. Touchdown PCR

71. In qPCR, what is monitored to measure the accumulation of PCR product?

a. Temperature b. pH

c. Fluorescence d. Pressure

72. Which pCR type is used to detect specific mutations or variations in DNA sequences?

a. Digital PCR (dPCR) b. Allele-Specific PCR

c. Multiplex PCR d. Inverse PCR

73. Which of the following pCR types involves the use of two primer sets in two successive PCR reactions?

a. Nested PCR b. Multiplex PCR

c. Overlapping PCR d. Touchdown PCR

74. What is the main advantage of multiplex PCR?

a. Increased specificity

b. Simultaneous amplification of multiple targets

c. Reduced reaction time

ity

s suitable for detecting low-abundance ex sample?

b. Digital PCR (dPCR)

d. Overlapping PCR

ing pCR types is used for whole genome

Amplification (RCA)

b. Ligation-Mediated PCR

c. Overlapping PCR

d. Anchored PCR

77. What does ddPCR stand for?

a. Digital Droplet Polymerase Chain Reaction

b. Double-Strand DNA Polymerase Reaction

c. Direct Detection PCR

d. Discontinuous DNA Polymerase Reaction

78. Which pCR type is commonly used for cloning and sequencing unknown DNA regions?

a. Inverse PCR b. RACE-PCR

c. Overlapping PCR d. Touchdown PCR

79. What is the purpose of touchdown PCR?

a. Reduce primer-dimer formation

b. Enhance specificity

c. Increase annealing temperature gradually

d. Amplify GC-rich regions

80. Which pCR type is used for the detection of RNA expression levels?

a. RT-PCR b. qPCR

c. Nested PCR d. Inverse PCR

81. What is the primary application of Allele-Specific PCR?

a. Quantification of DNA

b. Identification of specific mutations

c. Whole genome amplification

d. Detection of RNA expression levels

82. Which of the following is a disadvantage of multiplex PCR?

a. Simultaneous amplification of multiple targets

b. Increased reaction time

c. Reduced specificity

d. Higher cost

83. What is the purpose of RACE-PCR?

a. Quantify RNA expression levels

b. Clone and sequence unknown DNA regions

c. Detect specific mutations

d. Amplify GC-rich regions

84. Which pCR type is used for the detection of rare mutations in a background of wild-type sequences?

a. Nested PCR b. Multiplex PCR

c. Digital PCR (dPCR) d. RACE-PCR

85. What is the key feature of Overlapping PCR?

a. Amplification of adjacent DNA fragments in a single reaction

b. Simultaneous amplification of multiple targets

c. Gradual increase in annealing temperature

d. Use of two primer sets in two successive reactions

86. Which pCR type is used for the detection of specific DNA sequences in a complex mixture without prior purification?

a. Ligation-Mediated PCR b. Colony PCR

c. Touchdown PCR d. Anchored PCR

87. What is the primary advantage of Ligation-Mediated PCR?

a. High sensitivity

b. Simultaneous amplification of multiple targets

c. Whole genome amplification

d. Detection of RNA expression levels

88. Which enzyme is commonly used in reverse transcription during RT-PCR?

a. DNA ligase b. Reverse transcriptase

c. RNA polymerase d. DNA polymerase

89. What does RFLP stand for in the context of pCR?

a. Random Fragment Length Polymorphism

b. Restriction Fragment Length Polymorphism

c. Reverse Fragment Length Polymorphism

d. Randomized Fragment Length Polymerization

90. What does PCR stand for?

a. Protein Chain Reaction

b. Polymerase Chain Reaction

c. Polypeptide Chain Reaction

d. Prokaryotic Chain Reaction

91. Which enzyme is used in PCR to amplify DNA?

a. Ligase b. Helicase

c. DNA polymerase d. RNA polymerase

92. PCR is commonly used for:

a. Gene expression analysis b. DNA amplification

c. Protein purification d. Cell culture

93. What is the purpose of the denaturation step in PCR?

a. To separate double-stranded DNA

b. To introduce primers

c. To synthesize new DNA strands

d. To amplify the target gene

94. Which PCR variant is used to quantify gene expression levels?

a. Real-time PCR b. Reverse Transcription PCR

c. Nested PCR d. Long-range PCR

95. What is the main advantage of reverse transcription PCR (RT-PCR)?

a. Amplification of RNA b. Amplification of DNA

c. Detection of proteins d. Direct sequencing of DNA

96. In quantitative PCR (qPCR), what is used to measure the amount of amplified DNA?

a. Gel electrophoresis b. Fluorescent dyes

c. Restriction enzymes d. Southern blotting

97. What is the purpose of the annealing step in PCR?

a. To separate double-stranded DNA

b. To synthesize new DNA strands

c. To introduce primers

d. To amplify the target gene

98. Which type of PCR is used to amplify specific regions of a DNA sequence using two sets of primers?

a. Real-time PCR b. Multiplex PCR

c. Nested PCR d. Long-range PCR

99. PCR is widely used in forensic science for:

a. Identifying suspects

b. Crime scene reconstruction

c. Paternity testing

d. All of the above

100. What is the purpose of the extension step in PCR?

a. To separate double-stranded DNA

b. To introduce primers

c. To synthesize new DNA strands

d. To amplify the target gene

101. Which PCR technique allows the simultaneous amplification of multiple target sequences in a single reaction?

a. Real-time PCR b. Multiplex PCR

c. Nested PCR d. Long-range PCR

102. What is the role of primers in PCR?

a. To synthesize new DNA strands

b. To amplify the target gene

c. To separate double-stranded DNA

d. To introduce RNA into the reaction

103. In PCR, the number of DNA copies approximately doubles during each:

a. Denaturation step b. Annealing step

c. Extension step d. Amplification cycle

104. What is the purpose of nested PCR?

a. To increase specificity

b. To decrease sensitivity

c. To introduce primers

d. To synthesize new DNA strands

105. PCR is used in genetic engineering for:

a. DNA sequencing b. DNA amplification

c. Protein purification d. Gene splicing

106. Which type of PCR is used for the amplification of long DNA fragments?

a. Real-time PCR b. Multiplex PCR

c. Nested PCR d. Long-range PCR

107. What is the main application of digital PCR (dPCR)?

a. Gene expression analysis

b. Quantification of DNA copies

c. Protein purification

d. DNA sequencing

108. What is the primary advantage of multiplex PCR?

a. Simultaneous amplification of multiple targets

b. Higher sensitivity

c. Reduced reaction time

d. Amplification of long DNA fragments

109. In which step of PCR does the temperature need to be raised to separate the DNA strands?

a. Denaturation step b. Annealing step

c. Extension step d. Primer design step

110. What is the purpose of the hot-start PCR technique?

a. To reduce amplification efficiency

b. To enhance specificity

c. To prevent the denaturation step

d. To decrease the annealing temperature

111. What is the main application of allele-specific PCR?

a. Genotyping b. DNA amplification

c. Protein purification d. RNA quantification

112. Which type of PCR is used for the detection of low-abundance mutations in a sample?

a. Real-time PCR b. Digital PCR

c. Nested PCR d. Allele-specific PCR

113. In RT-qPCR, the reverse transcription step involves the conversion of:

a. DNA to RNA b. RNA to DNA

c. DNA to protein d. RNA to protein

114. What is the main advantage of quantitative PCR (qPCR) over conventional PCR?

a. Higher specificity

b. Real-time monitoring of DNA amplification

c. Simultaneous amplification of multiple targets

d. Amplification of long DNA fragments

115. Which PCR technique is used for the analysis of methylation patterns in DNA?

a. Real-time PCR

b. Methylation-specific PCR (MSP)

c. Digital PCR

d. Nested PCR

116. What is the purpose of the final extension step in PCR?

a. To separate double-stranded DNA

b. To introduce primers

c. To synthesize new DNA strands

d. To ensure complete amplification

117. Which PCR variant is used for the amplification of RNA?

a. Real-time PCR

b. Reverse Transcription PCR (RT-PCR)

c. Nested PCR

d. Digital PCR

118. What is a radioactive probe used for in molecular biology?

a. Gene therapy b. DNA sequencing

c. RNA detection d. Protein synthesis

119. Which of the following radioactive isotopes is commonly used in radioactive probes?

a. Carbon-14 b. Iodine-131

c. Hydrogen-3 (Tritium) d. All of the above

120. What is the main advantage of using a radioactive probe in molecular biology experiments?

a. High sensitivity b. Low cost

c. Ease of disposal d. Short half-life

121. In Southern blotting, radioactive probes are commonly used to detect:

a. RNA b. Proteins

c. DNA d. Lipids

122. Which technique involves the separation of DNA fragments based on size and their subsequent detection using a radioactive probe?

a. PCR (Polymerase Chain Reaction)

b. Western blotting

c. Southern blotting

d. Gel electrophoresis

123. What is the function of a radioactive label in a probe?

a. Enhances probe stability

b. Improves probe solubility

c. Facilitates detection and visualization

d. Increases probe specificity

124. Which of the following is a non-radioactive alternative to radioactive probes for nucleic acid detection?

a. Fluorescent probes b. Magnetic probes

c. Enzyme-labeled probes d. All of the above

125. What is the half-life of Iodine-131, commonly used in radioactive probes?

a. 8 days b. 30 years

c. 67 hours d. 3 minutes

126. Which technique uses radioactive probes to study gene expression levels?

a. Northern blotting b. Southern blotting

c. Western blotting d. PCR

127. In DNA fingerprinting, radioactive probes are used to detect:

a. Single nucleotide polymorphisms (SNPs)

b. Variable number tandem repeats (VNTRs)

c. DNA methylation patterns

d. Telomere length

128. Which type of radiation is commonly emitted by radioactive probes for detection purposes?

a. Alpha particles b. Beta particles

c. Gamma rays d. Neutrons

129. What is the purpose of denaturation in Southern blotting?

a. To break hydrogen bonds between DNA strands

b. To add a radioactive label to DNA

c. To separate RNA strands

d. To amplify DNA fragments

130. Which radioactive isotope is commonly used in the labeling of proteins for detection in Western blotting?

a. Carbon-14 b. Sulfur-35

c. Phosphorus-32 d. Fluorine-18

131. In autoradiography, what is used to visualize the location of radioactive probes on a membrane or gel?

a. X-ray film b. UV light

c. Fluorescent dye d. Infrared imaging

132. Which of the following is a limitation of using radioactive probes?

a. High cost b. Environmental concerns

c. Short half-life d. Limited sensitivity

133. Which technique is used for the detection of specific RNA sequences using a radioactive probe?

a. Northern blotting b. Southern blotting

c. Eastern blotting d. Western blotting

134. What is the primary disadvantage of using tritium (hydrogen-3) as a radioactive label in probes?

a. High cost b. Low sensitivity

c. Short half-life d. Limited availability

135. Which of the following is a safety consideration when working with radioactive probes?

a. Open bench work

b. Minimal protective equipment

c. Proper waste disposal

d. Ignoring contamination

136. What is the purpose of hybridization in the context of radioactive probes?

a. Amplifying DNA fragments

b. Separating DNA strands

c. Binding the probe to its complementary sequence

d. Introducing a radioactive label

137. Which technique uses a radioactive probe to study protein expression levels?

a. Southern blotting b. Western blotting

c. Northern blotting d. Eastern blotting

138. What is the primary advantage of using phosphorus-32 (32P) in radioactive probes?

a. Long half-life b. Low cost

c. High sensitivity d. Minimal environmental impact

139. Which of the following diseases can be studied using radioactive probes for genetic analysis?

a. Cancer b. Diabetes

c. Hypertension d. Osteoporosis

140. What is the purpose of blocking agents in the preparation of radioactive probes?

a. Enhancing probe stability

b. Preventing non-specific binding

c. Increasing probe solubility

d. Improving probe specificity

141. Which of the following techniques is commonly used for in situ hybridization with radioactive probes?

a. PCR

b. FISH (Fluorescence In Situ Hybridization)

c. Southern blotting

d. Northern blotting

142. What safety precautions should be taken when working with radioactive probes in the laboratory?

a. Use protective clothing and shielding

b. Minimize exposure time

c. Handle materials in a designated area

d. All of the above

143. What is a genomic library?

a. A collection of all the genes in an organism

b. A representation of the entire genome in a single test tube

c. A collection of DNA fragments representing an organism's genome

144. Which enzyme is commonly used to cut DNA into fragments for genomic library construction?

a. DNA polymerase b. RNA polymerase

c. Restriction enzymes

145. What is the purpose of using restriction enzymes in genomic library construction?

a. To amplify DNA

b. To cut DNA at specific recognition sequences

c. To join DNA fragments together

146. What is the primary difference between a genomic library and a cDNA library?

a. Genomic libraries contain only exons, while cDNA libraries contain introns.

b. Genomic libraries contain only coding sequences, while cDNA libraries contain the entire genome.

c. Genomic libraries contain both coding and non-coding DNA, while cDNA libraries only contain coding sequences.

147. Which of the following is NOT a commonly used vector for genomic library construction?

a. Plasmid

b. Bacterial artificial chromosome (BAC)

c. Polymerase chain reaction (PCR)

148. What is the purpose of using a selectable marker in the construction of a genomic library?

a. To identify recombinant DNA

b. To identify non-recombinant DNA

c. To identify the source organism

149. What is the function of a genomic library in molecular biology?

a. To store genetic information

b. To express genes in vitro

c. To study and analyze genes

150. Which technique is commonly used to screen a genomic library for a specific gene or sequence?

a. Polymerase chain reaction (PCR)

b. Southern blotting

c. DNA sequencing

151. What is the minimum information needed to uniquely identify a clone in a genomic library?

a. Vector sequence b. Insert sequence

c. Both a and b

152. What does the term "shotgun sequencing" refer to in the context of genomic libraries?

a. Sequencing a random selection of DNA fragments

b. Sequencing the entire genome in a single step

c. Sequencing only the coding regions of the genome

153. Which of the following is a disadvantage of using a genomic library for gene expression studies?

a. Difficulty in finding the desired gene

b. Presence of introns in the cloned sequences

c. Limited diversity of genes

154. What is the purpose of creating overlapping clones in a genomic library?

a. To reduce the size of the library

b. To increase the accuracy of sequencing

c. To eliminate non-functional genes

155. Which of the following is a key advantage of using BACs (Bacterial Artificial Chromosomes) in genomic libraries?

a. They can carry larger DNA fragments

b. They are easier to manipulate in the laboratory

c. They can self-replicate in eukaryotic cells

156. What is the role of a DNA probe in the screening of a genomic library?

a. To cut DNA into fragments

b. To identify the vector sequence

c. To hybridize with a specific DNA sequence

157. What is the size range of DNA fragments typically used in the construction of a genomic library?

a. 1-10 base pairs b. 100-500 base pairs

c. 1,000-100,000 base pairs

158. Which of the following is a limitation of using PCR-based methods in genomic library construction?

a. Difficulty in amplifying large DNA fragments

b. Limited specificity in primer binding

c. Lack of selectable markers

159. What is the significance of having a high transformation efficiency when creating a genomic library in a bacterial host?

a. It allows for the insertion of larger DNA fragments

b. It increases the number of recombinant clones

c. It reduces the need for selectable markers

160. In which form is the genomic DNA typically stored in a genomic library?

a. Single-stranded DNA b. Double-stranded DNA

c. RNA

161. Which of the following is an application of genomic libraries?

a. Gene therapy b. DNA fingerprinting

c. Both a and b

162. What is the purpose of using gel electrophoresis in the construction of a genomic library?

a. To separate DNA fragments based on size

b. To amplify DNA fragments

c. To identify vector sequences

163. Which enzyme is responsible for ligating DNA fragments into a vector during genomic library construction?

a. DNA polymerase b. Ligase

c. Helicase

164. What is the role of the origin of replication (ori) in a cloning vector used for genomic library construction?

a. It allows for the insertion of large DNA fragments

b. It ensures the replication of the vector in the host cell

c. It serves as a selectable marker

165. Which of the following is true regarding the representation of the genome in a genomic library?

a. The entire genome is always represented in a single clone

b. The representation is influenced by the size of the library and the insert DNA fragments

c. Only coding regions are represented in a genomic library

166. What is the purpose of using reverse transcriptase in the construction of a cDNA library?

a. To synthesize complementary RNA from a DNA template

b. To synthesize complementary DNA from an RNA template

c. To amplify DNA fragments

167. Which technique is commonly used to confirm the presence of a specific gene in a genomic library?

a. Northern blotting b. Southern blotting

c. Western blotting

168. What is the significance of having a low rate of false positives when screening a genomic library?

a. It reduces the chances of missing the desired gene

b. It increases the efficiency of the screening process

c. It prevents the formation of recombinant clones

169. What does cDNA stand for?

a. Cellular DNA b. Chromosomal DNA

c. Complementary DNA d. Cytoplasmic DNA

170. Which enzyme is commonly used to synthesize cDNA?

a. DNA polymerase b. RNA polymerase

c. Reverse transcriptase d. Ligase

171. What is the primary source of RNA for cDNA synthesis?

a. Genomic DNA b. Messenger RNA (mRNA)

c. Ribosomal RNA (rRNA) d. Transfer RNA (tRNA)

172. What is the purpose of reverse transcription in cDNA library preparation?

a. To amplify DNA

b. To synthesize RNA

c. To convert RNA into complementary DNA

d. To repair DNA damage

173. In cDNA synthesis, what serves as a primer for reverse transcriptase?

a. DNA primer b. RNA primer

c. Oligo(dT) primer d. Random hexamer primer

174. Which of the following is a characteristic feature of a cDNA library?

a. Contains only exons

b. Represents the entire genome

c. Includes introns and exons

d. Contains only introns

175. What is the role of the enzyme RNase H in cDNA synthesis?

a. Synthesizes RNA

b. Degrades RNA in RNA-DNA hybrids

c. Facilitates primer binding

d. Repairs DNA damage

176. Which technique is commonly used to analyze the size distribution of cDNA fragments?

a. Southern blotting b. Northern blotting

c. Western blotting d. Gel electrophoresis

177. What is the function of the poly(A) tail in cDNA synthesis?

a. Primer for reverse transcription

b. Enhances stability of cDNA

c. Acts as a promoter for RNA synthesis

d. Facilitates intron splicing

178. Which of the following is a disadvantage of cDNA libraries compared to genomic DNA libraries?

a. Inability to express genes

b. Lack of introns

c. Limited representation of non-coding regions

d. Unstable cDNA fragments

179. What is the role of a vector in the construction of a cDNA library?

a. Transcription initiation

b. DNA replication

c. Gene delivery into cells

d. Cloning and storage of cDNA fragments

180. Which of the following is a commonly used vector in cDNA library construction?

a. Plasmid b. Bacteriophage

c. Cosmid d. All of the above

181. What is the purpose of the screening process in cDNA library construction?

a. Identifying recombinant clones

b. Amplifying cDNA fragments

c. Sequencing genomic DNA

d. Digesting plasmids

182. Which method is used to amplify specific cDNA sequences during library screening?

a. Polymerase chain reaction (PCR)

b. DNA sequencing

c. Gel electrophoresis

d. Western blotting

183. What is the size range of cDNA fragments typically found in a cDNA library?

a. 1-10 base pairs b. 100-500 base pairs

c. 1-5 kilobase pairs d. 10-50 kilobase pairs

184. Which of the following is a step in the construction of a cDNA library?

a. DNA ligation b. DNA replication

c. DNA transcription d. DNA denaturation

185. What is the purpose of using restriction enzymes in cDNA library construction?

a. To amplify cDNA fragments

b. To cut genomic DNA into fragments

c. To degrade RNA

d. To facilitate reverse transcription

186. Which type of library is enriched with genes that are actively transcribed in a specific tissue or condition?

a. Genomic library b. cDNA library

c. Expression library d. GenBank library

187. Which of the following is NOT a method used for cDNA library screening?

a. Northern blotting b. Southern blotting

c. PCR amplification d. DNA sequencing

188. What is the purpose of reverse transcription-polymerase chain reaction (RT-PCR) in cDNA analysis?

a. Amplifying specific cDNA sequences

b. Synthesizing RNA from cDNA

c. Identifying recombinant clones

d. Digesting plasmids

189. Which of the following is a key advantage of using a cDNA library over a genomic library for gene expression studies?

a. Inclusion of introns

b. Larger fragment size

c. Higher gene representation

d. Stable mRNA molecules

190. What is the purpose of denaturation in cDNA synthesis?

a. Breaking hydrogen bonds between DNA strands

b. Inactivating reverse transcriptase

c. Degrading RNA

d. Amplifying cDNA fragments

191. Which technique is used to determine the nucleotide sequence of cDNA fragments?

a. Gel electrophoresis b. DNA sequencing

c. PCR amplification d. Northern blotting

192. What is the role of a primer in cDNA synthesis?

a. Initiating DNA replication

b. Initiating RNA synthesis

c. Initiating reverse transcription

d. Initiating PCR amplification

193. What is the primary function of gene expression in yeast?

a. DNA replication b. Protein synthesis

c. RNA splicing d. Cell division

194. Which of the following is a commonly used yeast in genetic engineering studies?

a. E. coli b. Saccharomyces cerevisiae

c. Streptococcus pyogenes d. Bacillus subtilis

195. What is the role of a promoter in gene expression?

a. Initiating DNA replication

b. Initiating transcription

c. Enhancing translation

d. Inhibiting mRNA synthesis

196. In yeast, what is the function of the URA3 gene commonly used in selection processes?

a. Resistance to antibiotics

b. Auxotrophy for uracil

c. Fluorescence protein expression

d. Enhanced replication

197. Which plasmid element is responsible for maintaining the plasmid in yeast cells during cell division?

a. Selectable marker b. Origin of replication

c. Enhancer sequence d. Introns

198. What is the purpose of using a yeast shuttle vector in genetic engineering?

a. To shuttle between different organisms

b. To transport proteins within yeast cells

c. To transfer genetic material between yeast and bacteria

d. To facilitate yeast cell division

199. Which step of gene expression involves the decoding of mRNA into a polypeptide chain?

a. Transcription b. Translation

c. Replication d. Reverse transcription

200. Which enzyme is responsible for transcribing DNA into RNA during gene expression?

a. DNA polymerase b. RNA polymerase

c. Ligase d. Helicase

201. What is the function of a terminator sequence in gene expression?

a. Initiating transcription

b. Enhancing translation

c. Stopping transcription

d. Promoting DNA replication

202. Which type of plasmid is commonly used for the expression of heterologous proteins in yeast?

a. Expression vector b. Replication vector

c. Transformation vector d. Insertion vector

203. What is the purpose of the GAL1 promoter in yeast genetic engineering?

a. Initiating cell division

b. Inducible expression of genes

c. Enhancing translation efficiency

d. Replicating plasmids

204. In yeast two-hybrid systems, what do the bait and prey represent, respectively?

a. Two different genes

b. Two interacting proteins

c. Two chromosomes

d. Two different cell types

205. Which process involves the removal of introns from pre-mRNA to produce mature mRNA?

a. Replication b. Transcription

c. Splicing d. Translation

206. Which of the following is a commonly used method to introduce foreign DNA into yeast cells?

a. Electroporation b. PCR amplification

c. Southern blotting d. Gel electrophoresis

207. What is the purpose of using auxotrophic markers in yeast genetic engineering?

a. To select for cells with specific nutritional requirements

b. To increase protein expression

c. To induce DNA replication

d. To enhance transcription efficiency

208. Which technique is commonly used for quantifying gene expression in yeast?

a. PCR (Polymerase Chain Reaction)

b. Western blotting

c. Southern blotting

d. Northern blotting

209. What is the role of CRISPR-Cas9 in yeast genetic engineering?

a. DNA replication initiation

b. Gene editing and manipulation

c. RNA splicing

d. Enhancing translation efficiency

210. Which of the following is a potential application of engineered yeast strains?

a. Enhanced wine production

b. Improved crop yield

c. Increased antibiotic resistance

d. Reduced atmospheric CO2 levels

211. What is a selectable marker commonly used in yeast genetic engineering for screening transformed cells?

a. GFP (Green Fluorescent Protein)

b. Ampicillin resistance gene

c. LacZ gene

d. Kanamycin resistance gene

212. Which process involves the synthesis of a complementary RNA strand from a DNA template?

a. Replication b. Transcription

c. Translation d. Reverse transcription

213. What is the function of the GAL4 protein in yeast two-hybrid systems?

a. Initiating transcription

b. Activating reporter genes

c. Inhibiting translation

d. Enhancing DNA replication

214. Which of the following is an example of a post-translational modification in gene expression?

a. mRNA splicing b. Phosphorylation

c. DNA replication d. RNA transcription

215. What is the purpose of using a terminator sequence in gene expression?

a. Initiating transcription

b. Enhancing translation

c. Stopping transcription

d. Promoting DNA replication

216. Which enzyme is commonly used to synthesize cDNA from RNA in reverse transcription?

a. DNA polymerase b. RNA polymerase

c. Reverse transcriptase d. Ligase

217. In the context of genetic engineering, what does the acronym PCR stand for?

a. Protein Chain Reaction

b. Polymerase Cell Reaction

c. Polymerase Chain Reaction

d. Protein Cell Reaction

218. What is the primary goal of chromosome engineering?

a. Increase chromosome number

b. Modify genetic material within chromosomes

c. Reduce chromosome size

d. Eliminate chromosomes

219. Which technique is commonly used for chromosome engineering?

a. Polymerase Chain Reaction (PCR)

b. Southern blotting

c. CRISPR-Cas9

d. Gel electrophoresis

220. What does CRISPR stand for in the context of chromosome engineering?

a. Chromosomal Repair and Integration of Segments

b. Clustered Regularly Interspaced Short Palindromic Repeats

c. Chromosome Replication and Insertion System

d. Chromosomal Recombination and Integration of Specific Proteins

221. Which of the following is NOT a potential application of chromosome engineering?

a. Gene therapy

b. Genetic modification of crops

c. Creating genetically modified organisms (GMOs)

d. Treating bacterial infections

222. Which enzyme is commonly used in CRISPR-Cas9 technology to cut DNA at specific locations?

a. DNA ligase b. RNA polymerase

c. Restriction endonuclease d. Cas9 nuclease

223. What is the role of guide RNA (gRNA) in CRISPR-Cas9 technology?

a. To synthesize new DNA strands

b. To guide Cas9 to the target DNA sequence

c. To repair damaged DNA

d. To amplify DNA fragments

224. Which of the following statements about homologous recombination is true?

a. It involves the insertion of foreign DNA into a target chromosome.

b. It is a random process with no specificity for target DNA sequences.

c. It occurs only in prokaryotes.

d. It requires sequence similarity between the introduced DNA and the target chromosome.

225. What is aneuploidy in the context of chromosome engineering?

a. Presence of an extra set of chromosomes

b. Absence of a set of chromosomes

c. Abnormal number of chromosomes

d. Perfectly balanced chromosome number

226. Which of the following is a potential risk associated with chromosome engineering?

a. Increased genetic diversity

b. Unintended off-target effects

c. Enhanced resistance to diseases

bd. Improved crop yield

227. In which phase of the cell cycle does homologous recombination mainly occur?

a. G1 phase b. S phase

c. G2 phase d. M phase

228. What is a transgene in the context of chromosome engineering?

a. A gene that codes for a transcription factor

b. A gene transferred from one organism to another

c. A gene responsible for transposon movement

d. A gene involved in translation

229. Which of the following is a non-viral vector used in chromosome engineering?

a. Adenovirus b. Retrovirus

c. Plasmid d. Lentivirus

230. What is the purpose of using a selectable marker in chromosome engineering experiments?

a. To mark the location of a specific gene on a chromosome

b. To selectively kill or allow the growth of cells with the engineered chromosome

c. To determine the sequence of a chromosome

d. To visualize chromosomes under a microscope

231. Which of the following techniques is used to analyze the size and structure of chromosomes?

a. PCR b. Karyotyping

c. Western blotting d. ELISA

232. What is a centromere?

a. The end of a chromosome

b. The middle region of a chromosome where sister chromatids are attached

c. A specialized region of DNA that regulates gene expression

d. A structure involved in chromosome movement during cell division

233. Which of the following is a limitation of CRISPR-Cas9 technology?

a. High specificity

b. Inability to target specific DNA sequences

c. Potential off-target effects

d. Limited applications in eukaryotes

234. What is the function of telomeres in chromosomes?

a. To control the cell cycle

b. To protect the ends of chromosomes from deterioration

c. To regulate gene expression

d. To facilitate chromosome condensation

235. Which type of chromosomal mutation involves the exchange of genetic material between non-homologous chromosomes?

a. Deletion b. Duplication

c. Translocation d. Inversion

236. What is the significance of a "knockout" organism in chromosome engineering?

a. It has an extra copy of a specific gene.

b. It lacks a functional copy of a specific gene.

c. It has a modified chromosome number.

d. It exhibits enhanced genetic diversity.

237. Which of the following is an example of a chromosomal disorder caused by aneuploidy?

a. Down syndrome b. Hemophilia

c. Cystic fibrosis d. Huntington's disease

238. What is the primary advantage of using CRISPR-Cas9 over traditional genetic engineering methods?

a. Higher cost-effectiveness

b. Greater precision and specificity

c. Faster results

d. Reduced need for laboratory equipment

239. Which enzyme is responsible for the synthesis of complementary DNA strands during homologous recombination?

a. DNA polymerase b. RNA polymerase

c. DNA ligase d. Helicase

240. What is the function of a DNA ligase in chromosome engineering?

a. To unwind the DNA double helix

b. To catalyze the formation of phosphodiester bonds between DNA fragments

c. To cut DNA at specific sites

d. To replicate DNA strands

241. Which of the following is a technique used for visualizing chromosomes under a microscope?

a. PCR

b. FISH (Fluorescence In Situ Hybridization)

c. Western blotting

d. ELISA

ANSWERS:

1.b,2,c,3.c,4c.c,5.c,6.c,7.a,8.c,9.b,10.c,11.c,12.b,13.c,14.a,

15.b,16.c,17.a,18.d,19.b,20.b,21.c,22.a,23.c,24.c,25.a,26.a,

27.b,28.b,29.c,30.b,31.b,32.b,33.b,34.b,35.b,36.d,37.b,38.b,39

.b,40.d,41.a,42.c,43.b,44.c,45.c,46.b,47.b,48.b,49.b,50.a,

51.a,52.d,53.b,54.b,55.c,56.c,57.d,58.c,59.b,60.b,61.c,62.b,63.
d,64.c,65.b,66.c,67.c,68.d,69.a,70.b,71.c,72.b,73.a,74.b,75.b,7
6.a,77.a,78.b,79.c,80.a,81.b,82.c,83.b,84.c,85.a,86.b,87.a,88.b,
89.b,90.b,91.c,92.b,93.a,94.a,95.a,96.b,97.c,98.c,99.d,100.c
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1.c,162.a,163.b,164.b,165.b,166.b,167.b,168.a,169.c,170.c,17
1.b,172.c,173.d,174.a,175.b,176.d,177.b,178.c,179.d,180.d,18
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c,202,a,203.b,204.b,205.c,206.a,207.a,208.d,209.b,210.a,211.a
,212.b,213.b,214.b,215.c,216.c,217.c,218.b,219.c,220.b,221.d,
222.d,223.b,224.d,225.c,226.b,227.b,228.b,229.c,230.b,231.b,
232.b,233.c,234.b,235.c,236.b,237.a,238.b,239.a,240.b,241.b

"KNOWLEDGE IS THE KEY THAT UNLOCKS EVERY DOOR."

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