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प्रश्नपुस्तिका क्रमांक
Question Booklet No.

O.M.R. Serial No. | | | | | | | | |

प्रश्नपुस्तिका सीरीज
Question Booklet Series
C

M.Sc (Biotechnology) Third Semester, Examination, February/March-2022
MBT-3002
Principles of Genetic Engineering

Time : 1:30 Hours **Maximum Marks-100**

जब तक कहा न जाय, इस प्रश्नपुस्तिका को न खोलें

निर्देश : –

1. परीक्षार्थी अपने अनुक्रमांक, विषय एवं प्रश्नपुस्तिका की सीरीज का विवरण यथास्थान सही– सही भरें, अन्यथा मूल्यांकन में किसी भी प्रकार की विसंगति की दशा में उसकी जिम्मेदारी स्वयं परीक्षार्थी की होगी।
2. **इस प्रश्नपुस्तिका में 100 प्रश्न हैं, जिनमे से केवल 75 प्रश्नों के उत्तर परीक्षार्थियों द्वारा दिये जाने है। प्रत्येक प्रश्न के चार वैकल्पिक उत्तर प्रश्न के नीचे दिये गये हैं। इन चारों में से केवल एक ही उत्तर सही है। जिस उत्तर को आप सही या सबसे उचित समझते हैं, अपने उत्तर पत्रक (O.M.R. ANSWER SHEET)में उसके अक्षर वाले वृत्त को काले या नीले बाल प्वांइट पेन से पूरा भर दें। यदि किसी परीक्षार्थी द्वारा निर्धारित प्रश्नों से अधिक प्रश्नों के उत्तर दिये जाते हैं तो उसके द्वारा हल किये गये प्रथमतः यथा निर्दिष्ट प्रश्नोत्तरों का ही मूल्यांकन किया जायेगा।**
3. प्रत्येक प्रश्न के अंक समान हैं। आप के जितने उत्तर सही होंगे, उन्हीं के अनुसार अंक प्रदान किये जायेंगे।
4. सभी उत्तर केवल ओ०एम०आर० उत्तर पत्रक **(O.M.R. ANSWER SHEET)** पर ही दिये जाने हैं। उत्तर पत्रक में निर्धारित स्थान के अलावा अन्यत्र कहीं पर दिया गया उत्तर मान्य नहीं होगा।
5. ओ०एम०आर० उत्तर पत्रक **(O.M.R. ANSWER SHEET)** पर कुछ भी लिखने से पूर्व उसमें दिये गये सभी अनुदेशों को सावधानीपूर्वक पढ़ लिया जाय।
6. परीक्षा समाप्ति के उपरान्त परीक्षार्थी कक्ष निरीक्षक को अपनी प्रश्नपुस्तिका बुकलेट एवं ओ०एम०आर० शीट पृथक–पृथक उपलब्ध कराने के बाद ही परीक्षा कक्ष से प्रस्थान करें।
7. निगेटिव मार्किंग नहीं है।

महत्वपूर्ण : – **प्रश्नपुस्तिका खोलने पर प्रथमतः जॉच कर देख लें कि प्रश्नपुस्तिका के सभी पृष्ठ भलीभॉति छपे हुए हैं। यदि प्रश्नपुस्तिका में कोई कमी हो, तो कक्ष निरीक्षक को दिखाकर उसी सीरीज की दूसरी प्रश्नपुस्तिका प्राप्त कर लें।**

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1. Which technique is used for analysis of differential expression of genes?
   (A) Micro array
   (B) RAPD
   (C) RFLP
   (D) Colony hybridization
2. CRISPR is a type of?
   (A) Gene cloning tool
   (B) Genome sequence analysis tool
   (C) Genome editing tool
   (D) Mutagenesis tool
3. What is an average length of microRNA?
   (A) 10-15 nucleotide
   (B) 20-25 nucleotide
   (C) 30-40 nucleotide
   (D) 40-50 nucleotide
4. Which complex helps in catalysis of RNA degradation by siRNA or miRNA?
   (A) Dicer
   (B) ERG
   (C) RISC
   (D) AGO
5. Which enzyme processes formation of siRNA form dsRNA intermediates?
   (A) RNA polymerase
   (B) DNA polymerase
   (C) Dicer
   (D) RNase

6. Which is an endogenous genomic tool for regulating gene expression?

(A) tRNA

(B) miRNA

(C) rRNA

(D) snRNA

7. Which type of RNA are used in gene interference?

(A) tRNA and rRNA

(B) mRNA and snRNA

(C) rRNA and snoRNA

(D) siRNA and miRNA

8. Which type of RNA also has catalytic function?

(A) mRNA

(B) rRNA

(C) tRNA

(D) miRNA

9. Which non-coding RNA is regulatory in nature?

(A) mRNA

(B) miRNA

(C) rRNA

(D) tRNA

10. Embryonic stem cell technique applies to?

(A) Cloning of Dolly sheep

(B) Cloning in bacterial colonies

(C) Preparation of genetic modified animals

(D) Cloning of plants

11. Electroporation is a method for?

(A) Transfer of gene in cells

(B) Bacterial transduction

(C) Heat-shock to bacteria

(D) Heat-shock to viruses

12. Lipofectamine is used of the process of?

(A) Transformation

(B) Transfection

(C) Transition

(D) Transduction

13. Which is not a part of omics technologies?

(A) Transcriptomic

(B) Metabolomics

(C) Genomics

(D) None of above

14. ATP sulfurylase is mainly used in which sequencing method?

(A) Sanger

(B) Maxam Gilbert

(C) Pyrosequencing

(D) Edman

15. The Klenow fragment is a type of?

(A) Restriction enzyme

(B) DNA Polymerase

(C) Helicase

(D) Gyrase

16. Which agent is used for chain termination in DNA sequencing?
    (A) Deoxynucleotides
    (B) Dideoxynucleotides
    (C) DNase
    (D) RNase
17. Sanger's method of DNA sequencing requires which enzyme?
    (A) Gyrase
    (B) Polymerase
    (C) Nuclease
    (D) Helicase
18. Which type of DNA cleavage is in Maxam Gilbert method of DNA sequencing?
    (A) Gene specific
    (B) Bond specific
    (C) Edge
    (D) Base specific
19. Which is an important step for preparing templates for Next Generation Sequencing?
    (A) Breaking DNA up into smaller fragments
    (B) Isolating DNA form tissue
    (C) Checking the quality and quantity of the fragment library
    (D) All of the above
20. Hydrazing cleaves which nucleotide inchain termination method of DNA sequencing?
    (A) T
    (B) C
    (C) A
    (D) G

21. The principle of chain termination method of DNA sequencing is based on?

(A) Cleavage of terminal nucleotides using chemicals

(B) Cleavage of nucleotides using endonuclease

(C) Cleavage of nucleotides using exonuclease

(D) Cleavage of hydrogen bonds between nucleotide pairs

22. Chemical cleavage of method of DNA sequencing is also known as?

(A) Sanger's method

(B) Edman Degradation methods

(C) Maxam and Gilbert method

(D) Beckman's method

23. Detection of mutation fragmented proteins is usually done by?

(A) SDS-PAGE

(B) Protein Truncation Test

(C) Agarose Gel Electrophoresis

(D) Native-PAGE

24. Which is not an essential component of Western blotting?

(A) Primary antibody interaction

(B) Ethidium bromide staining

(C) Electrophoresis of proteins

(D) Blocking of proteins

25. What are used by Mismatch Chemical Cleavage to detect mutations?

(A) Hydroxylamine and piperidine

(B) Guanidine and nuclease

(C) Endonuclease and exonuclease

(D) Guanidine and endonuclease

26. Detection of mutations by separation of DNA in presence of denaturing agents is done by?

(A) Denaturing Gradient Gel Electrophoresis

(B) Single Strand Conformational Polymorphism

(C) Site-Directed Mutagenesis

(D) Temperature Gradient Gel Electrophoresis

27. Which mutation detection technique utilizes restriction enzymes?

(A) Single Strand Conformational Polymorphism

(B) Oligo Ligation Assay

(C) Restriction Fragment Length Polymorphism

(D) Protein Truncation Test

28. Which mutation does not cause hereditary change in organisms?

(A) Germline mutations

(B) Somatic mutations

(C) Both

(D) None

29. Gain of genetic material is caused in which type of chromosomal mutation?

(A) Translocation

(B) Inversion

(C) Deletion

(D) Duplication

30. Total number of nucleotides do change in which type of mutation?

(A) Frameshift by mutation

(B) Frameshift by insertion

(C) Inversion

(D) Deletion

31. A mutation causes change in one nucleotide sequence but no change in amino acid sequence because of?
    (A) Codon bias
    (B) Same codon can code multiple amino acids
    (C) Code degeneracy of codons
    (D) One codon can code only one amino acid
32. Frameshift mutation can cause disaster change due to?
    (A) Insertion of START codon
    (B) Insertion of STOP codon
    (C) Removal of one amino acid
    (D) Addition of one amino acid
33. PCR with mutated oligonucleotide primers is used for?
    (A) DNA damage repair
    (B) Mutation repair
    (C) Construction of genomic library
    (D) Ct value does not matter to DNA quantification
34. Which statement related to Cyclic threshold (Ct) value is true for Real-Time PCR quantification of DNA?
    (A) Low Ct value, Low DNA quantity
    (B) Low Ct value, high DNA quantity
    (C) High Ct value, high DNA quantity
    (D) Ct value does not matter to DNA quantification
35. TaqMan probes used in Real-Time PCR detection work on the principle of?
    (A) FRET
    (B) FLIP
    (C) FRAP
    (D) None of above

36. SYBR green dye works by?

(A) Absorbs 620nm wavelength and emits 660nm wavelength

(B) Absorbs 660nm wavelength and emits 600nm wavelength

(C) Absorbs 497nm wavelength and emits 520nm wavelength

(D) Absorbs 520nm wavelength and emits 497nm wavelength

37. Ethidium bromide stains DNA by?

(A) Intercalating DNA at minor groove only

(B) Intercalating DNA at major groove only

(C) Intercalating DNA between base pairs

(D) Intercalating DNA at G-C bonds only

38. What is the optimal temperature range for enzymatic activity of Taq DNA polymerase?

(A) 30-40^{o}C

(B) 40-50^{o}C

(C) 50-60^{o}C

(D) 70-80^{o}C

39. cDNA synthesis is primary function of?

(A) Real Time-PCR

(B) Allele-Specific PCR

(C) Reverse Transcriptase-PCR

(D) None

40. What GC content is most suitable for a primer?

(A) 20-40%

(B) 40-60%

(C) 60-80%

(D) GC Content does not matter to primer designing

41. Which sequence is correct for Real-Time PCR?

(A) Annealing>Denaturation>Amplification>Detection

(B) Denaturation>Detection>Annealing>Amplification

(C) Denaturation>Annealing>Amplification>Detection

(D) Denaturation>Annealing>Detection>Amplification

42. What are the essential components of Conventional PCR and Real-Time PCR both?

(A) DNA template, dNTPs

(B) Taq DNA polymerase, Mg2+

(C) DNA template, Taq DNA polymerase

(D) All of above

43. Conventional PCR differs from Real-Time PCR mainly because?

(A) PCR is end point assay

(B) Real-Time PCR is end point assay

(C) PCR is quantitative assay

(D) All of above

44. Which techniques is comparable to in vivo DNA replication?

(A) Restriction endonuclease

(B) Far-Eastern blotting

(C) Polymerase chain reaction

(D) TUNEL assay

45. Which type of library usually possesses introns?

(A) Genomic library

(B) cDNA library

(C) Both

(D) None of above

46. Which hybridization principle is utilized for screening of genomic library?

(A) Southern hybridization

(B) Northern hybridization

(C) Western blotting

(D) Eastern blotting

47. Which sequence is correct for construction of genomic library?

(A) cDNA synthesis>recombinant transformation>restriction>library screening

(B) cDNA synthesis>restriction>recombinant transformation>library screening

(C) DNA extraction>recombinant transformation>restriction>library screening

(D) DNA extraction>restriction>recombinant transformation>library screening

48. Which library belongs to specific genes, not the whole genome?

(A) cDNA library

(B) Genomic library

(C) Both

(D) None

49. Which bacterial reproduction method is a cloning methodology?

(A) Conjugating

(B) Transformation

(C) Transduction

(D) None

50. Gene gun method for transfer of genes requires?

(A) Calcium coating of DNA

(B) Magnesium coating of DNA

(C) Copper coating of DNA

(D) Gold coating of DNA

51. Which is most common method for transfer of genes in plant cells?

(A) Gene gun methods

(B) Calcium chloride treatment

(C) YAC vector

(D) Cellulose treatment

52. Which heat-shock method is common to make bacteria competent for transformation?

(A) $4^{o}C$ for 1 hr.

(B) $42^{o}C$ for 1 hr.

(C) $42^{o}C$ for 45 sec

(D) $4^{o}C$ for 45 sec

53. Which is the most common chemical agent to make bacteria competent for transformation?

(A) Ethidium bromide

(B) Calcium chloride

(C) Sodium carbonate

(D) Sodium chloride

54. Bacterial transformation was proposed for the first time by?

(A) Watson and Crick, 1953

(B) Frederick Griffith, 1928

(C) Weismann, 1914

(D) Thomas Hunt Morgan, 1914

55. Insertion of foreign DNA into host cells must consider that?

(A) the surface charge DNA being negative

(B) the surface charge DNA being positive

(C) the surface charge DNA being neutral

(D) the surface charge DNA does not affect insertion

56. Which statement is not correct for cloning of Dolly sheep?

(A) Enucleated ovum was used for fusion

(B) Somatic cell nucleus was used for fusion

(C) It was genetically similar to somatic cell donor

(D) Enucleated somatic cell was used for fusion

57. Cloning of Dolly sheep is an example of?

(A) Gene manipulation

(B) Molecular cloning

(C) Reproductive cloning

(D) Transformation

58. His-tagged proteins purification requires which chemical analogue?

(A) Glutathione

(B) Imidazole

(C) Glutamine

(D) Glucose

59. Polyhistidine tag preceded by methionine is added in proteins at which terminal?

(A) C-terminal

(B) N-terminal

(C) Both

(D) None

60. GST-tagged proteins purification requires which chemical analogue?

(A) Glutathione

(B) Imidazole

(C) Glutamine

(D) Glucose

61. Which affinity media is used to purify His-tag proteins?

(A) Fe-Agar

(B) Na-Carboxy

(C) Ni-NTA

(D) Mg-Agar

62. His-tag proteins contains what number of histidine amino acids?

(A) 10

(B) 60

(C) 6

(D) 16

63. MBP-tagged proteins purification requires which chemical analogue?

(A) Glucose

(B) Fructose

(C) Maltose

(D) Mannose

64. pMAL protein fusion and purification system contains which specific protein fusion system?

(A) Maltose-binding protein

(B) Glucose-binding protein

(C) Glutamine-binding protein

(D) Mannose-binding protein

65. pET bacterial recombinant protein vector contains which specific promoter?

(A) TATA box

(B) T7 promoter

(C) EP1 promoter

(D) LEF promoter

66. Which chromatography technique is most appropriate for purification of cloned proteins?

(A) Affinity chromatography

(B) Cation-exchange chromatography

(C) Anion-exchange chromatography

(D) Gel- filtration chromatography

67. Which vector was appropriate for cloning large DNA Fragments in human genome project?

(A) Plasmid

(B) Yeast artificial chromosome

(C) Cosmid

(D) pBR322

68. Which cloning vector is used for Phage Display system?

(A) Phagemid

(B) Cosmid

(C) YAC

(D) BAC

69. Which cloning vector can accommodate 300-1000kb large insert?

(A) Plasmid

(B) λ-phage

(C) pBR322

(D) Yeast artificial chromosome

70. F+ plasmid bacteria contain?

(A) Fermentation factor

(B) Conjugative

(C) Integrative

(D) Fertility factor

71. Bacteriophage lambda (λ) life cycle is?

(A) Lysogenic

(B) Lytic

(C) Conjugative

(D) Integrative

72. Which enzyme expression is used for Blue-White Screening of recombinant colonies?

(A) Alkaline phosphatase

(B) Alpha-amylase

(C) Beta-galactosidase

(D) Oxidoreductase

73. Which is not a type of cloning vector?

(A) pUC18

(B) pBR322

(C) M13

(D) EST

74. Which is an example of production of a recombinant therapeutic peptide?

(A) Humulin insulin

(B) Glucagon

(C) Cellulose

(D) Taq DNA polymerase

75. Which type of RNA act as exogenous genomic tool for regulation of gene expression?

(A) rRNA

(B) mRNA

(C) siRNA

(D) miRNA

76. Which statement is false for a plasmid?

(A) It is double stranded

(B) Its replication depends upon host cell

(C) It is extrachromosomal

(D) It is closed and circular DNA

77. A plasmid can be considered as a suitable cloning vector because?

(A) It possesses a single restriction site for one or more restriction enzymes

(B) It can be readily isolated from the cells

(C) Insertion of foreign DNA does not alter its replication properties

(D) All of above

78. pBR 322 vector has which selection markers?

(A) Ampicillin resistance

(B) Tetracycline resistance

(C) Both

(D) None

79. Ti plasmid is obtained from?

(A) Thermus aquaticus

(B) Escherichia coli

(C) Haemophilus influenzae

(D) Agrobacterium tumefaciens

80. A cloning vector is characterized by presence of?

(A) Selectable markers site

(B) Multiple cloning site

(C) Ori site

(D) All of above

81. Which method is used to analyze protein-DNA interaction?

(A) Real Time-PCR

(B) Colony hybridization

(C) ELISA

(D) Electrophoretic Mobility Shift Assay

82. 'Whole chromosome paint' fluorescent analysis is done by?

(A) Colony assay

(B) Flow cytometry

(C) Fluorescence in situ Hybridization

(D) ELISA

83. What type of membrane is used for transfer of DNA or RNA in hybridization methods?

(A) Agarose

(B) Acrylamide

(C) Cellophane

(D) Nitrocellulose

84. What converts dsDNA to ssDNA for probe labelling in Southern hybridization?

(A) 0.5M NaCl

(B) 0.5M NaOH

(C) 5MHCl

(D) 0.2M EDTA

85. Which is proper order of steps in Northern hybridization?

(A) RNA isolation>Probe labelling>Electrophoresis>Autoradiography

(B) RNA isolation>Probe labelling>Autoradiography>Electrophoresis

(C) Probe labelling>RNA isolation>Electrophoresis>Autoradiography

(D) RNA isolation>Electrophoresis>Probe labelling>Autoradiography

86. Terminal deoxynucleotidyl transferase (TdT) is a type of:

(A) Template-dependent DNA Ligase

(B) Template-independent DNA ligase

(C) Template-independent DNA polymerase

(D) None

87. Oligonucleotide linkers help in cloning by?

(A) Ligation of blunt end DNA

(B) Ligation of sticky end DNA

(C) Both

(D) None

88. Alkaline phosphatase act by?

(A) Addition of phospho-group at 3' end of DNA

(B) Removal of phospho-group at 3' end of DNA

(C) Addition of OH-group at 3' end of DNA

(D) Removal of OH-group at 3' end of DNA

89. Which is not a type of nuclease enzyme?

(A) DNA polymerase

(B) DNA ligase

(C) Reverse transcriptase

(D) All of above

90. What is DNA ligase adenylation?

(A) cAMP-dependent phosphorylation of DNA ligase

(B) Addition of poly-A tail in DNA ligase

(C) Addition of ATP-dependent AMP to DNA ligase

(D) Removal of poly-A tail from DNA ligase

91. DNA ligases catalyse?

(A) Formation of glycosidic bonds

(B) Formation of phosphodiester bonds

(C) Formation of hydrogen bonds

(D) None of above

92. Restriction-Modification system in bacteria helps in?

(A) Protects bacteria from own endonuclease activity via DNA methylation

(B) Protects bacteria from viral exonuclease activity via DNA methylation

(C) Protects eukaryotes form endonuclease activity via DNA methylation

(D) Protects eukaryotes form viral exonuclease activity via DNA methylation

93. What are Neoschizomers?

(A) Restriction enzymes cutting at multiple sites

(B) Multiple restriction sites for multiple restriction enzyme

(C) Multiple restriction enzymes recognising same restriction site

(D) None

94. Blunt cutting restriction enzymes cut DNA strand at?

(A) Glycosidic bond

(B) Phosphodiester bond

(C) Hydrogen bonds

(D) None

95. Which enzyme catalyses formation of phosphodiester bond in DNA strands?

(A) DNase I

(B) Smal restrictase

(C) T4 DNA Ligase

(D) DNA methylase

96. EcoRI restriction enzymes recognizes which nucleotide sequence site?

(A) ATGCAT

(B) GAATTC

(C) GGGCCC

(D) TATAAT

97. Which enzymes remove nucleotides from terminal part of DNA molecules?

(A) Helicase

(B) Endonuclease

(C) Exonuclease

(D) DNA Polymerase II

98. Which restriction enzyme was characterized as first?

(A) EcoRI

(B) HindII

(C) BamHI

(D) Sall

99. Usually how many nucleotide bases are recognized as part of the restriction site?

(A) 6

(B) 60

(C) 120

(D) 240

100. Restriction Enzymes are primarily originated form?

(A) Eukaryotes

(B) Algae

(C) Bacteria

(D) Retroviruses

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Rough Work / रफ कार्य

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2. **This Question Booklet contains 100 questions, out of which only 75 Question are to be Answered by the examinee. Every question has 4 options and only one of them is correct. The answer which seems correct to you, darken that option number in your Answer Booklet (O.M.R ANSWER SHEET) completely with black or blue ball point pen. If any examinee will mark more than one answer of a particular question, then the first most option will be considered valid.**
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