

Roll No.

Question Booklet Number

O. M. R. Serial No.

| | | | | | | | |
|--|--|--|--|--|--|--|--|
| | | | | | | | |
|--|--|--|--|--|--|--|--|

| |
|-------------------------|
| Question Booklet Number |
|-------------------------|

M. Sc. (Microbiology) (Second Semester) (NEP)

EXAMINATION, 2022-23

RECOMBINANT DNA TECHNOLOGY

| Paper Code | | | | | | | |
|------------|---|---|---|---|---|---|---|
| L | 0 | 4 | 0 | 8 | 0 | 3 | T |

| |
|-----------------------------|
| Questions Booklet Series |
| A |

Time : 1:30 Hours]

[Maximum Marks : 75

Instructions to the Examinee :

1. Do not open the booklet unless you are asked to do so.
2. The booklet contains 100 questions. Examinee is required to answer 75 questions in the OMR Answer-Sheet provided and not in the question booklet. All questions carry equal marks.
3. Examine the Booklet and the OMR Answer-Sheet very carefully before you proceed. Faulty question booklet due to missing or duplicate pages/questions or having any other discrepancy should be got immediately replaced.

परीक्षार्थियों के लिए निर्देश :

1. प्रश्न-पुस्तिका को तब तक न खोलें जब तक आपसे कहा न जाए।
2. प्रश्न-पुस्तिका में 100 प्रश्न हैं। परीक्षार्थी को 75 प्रश्नों को केवल दी गई OMR आन्सर-शीट पर ही हल करना है, प्रश्न-पुस्तिका पर नहीं। सभी प्रश्नों के अंक समान हैं।
3. प्रश्नों के उत्तर अंकित करने से पूर्व प्रश्न-पुस्तिका तथा OMR आन्सर-शीट को सावधानीपूर्वक देख लें। दोषपूर्ण प्रश्न-पुस्तिका जिसमें कुछ भाग छपने से छूट गए हों या प्रश्न एक से अधिक बार छप गए हों या उसमें किसी अन्य प्रकार की कमी हो, तो उसे तुरन्त बदल लें।

(Remaining instructions on the last page)

(शेष निर्देश अन्तिम पृष्ठ पर)

(Only for Rough Work)

1. Who discovered restriction enzymes ?
 - (A) Watson and Crick
 - (B) Jacob and Monad
 - (C) Nathan, Arber and Smith
 - (D) Boyer and Cohen

2. Bacteria protect themselves from viruses by fragmenting viral DNA upon entry with :
 - (A) Exonuclease
 - (B) Gyrase
 - (C) Endonuclease
 - (D) Ligase

3. Which of the following bacterial strains cannot be isolated during a genetic analysis of the restriction-modification system ?
 - (A) Restriction-Modification Proficient (R+M+)
 - (B) Restriction-Modification Deficient (R-M-)
 - (C) Restriction Deficient-Modification Proficient (R-M+)
 - (D) Restriction Proficient-Modification Deficient (R+M-)

4. DNA M and DNA N were digested with restriction enzyme *EcoRI* and analyzed by agarose gel electrophoresis. If DNA M gave three fragments and DNA N gave four fragments, then which of the following are correct ?
 - (P) DNA M has two restriction recognition sites and is circular
 - (Q) DNA N has four restriction recognition sites and is circular
 - (R) DNA M has two restriction recognition sites and is linear
 - (S) DNA N has four restriction recognition sites and is linear
 - (A) Q and R
 - (B) P and S
 - (C) P and Q
 - (D) R and S

5. Which type of restriction endonucleases is used most in genetic engineering ?
 - (A) Type I
 - (B) Type II
 - (C) Type III
 - (D) Type IV

6. Three restriction endonucleases *HaeIII*, *KpnI*, and *NotI* recognize recognition site of 4bp, 6bp, and 8bp sequences, respectively. The relative frequency of occurrence of these recognition sites on a bacterial genome is :
- (A) *HaeIII*>*KpnI*>*NotI*
 (B) *HaeIII*>*NotI*>*KpnI*
 (C) *NotI*>*KpnI*>*HaeIII*
 (D) *KpnI*>*NotI*>*HaeIII*
7. This was the first restriction endonuclease that was discovered :
- (A) *BamHI*
 (B) *EcoRI*
 (C) *HindIII*
 (D) *HindII*
8. Pairs of restriction enzymes that have slightly different recognition sequences, but upon cleavage of DNA, generate identical overhanging termini sequences, are called :
- (A) Isoschizomers
 (B) Neoschizomers
 (C) Isocaudomers
 (D) None of the above
9. The T4 DNA ligase and *Escherichia coli* DNA ligase require factors, respectively.
- (A) ATP and GTP
 (B) ATP and NAD⁺
 (C) NAD⁺ and FAD⁺
 (D) GTP and FAD⁺
10. What is the characteristic of *lacZ* gene of pUC18 vector among the following ?
- (A) Encodes for antibiotic resistance
 (B) Encodes for β -galactosidase enzyme
 (C) Encodes for β -lactamase enzyme
 (D) Encodes for β -galactoside transferase enzyme
11. Which is the enzyme used to remove phosphate group from the 5' end of the DNA ?
- (A) Polynucleotide Kinase
 (B) Terminal Deoxynucleotidyl Transferase
 (C) Alkaline Phosphatase
 (D) Restriction Endonuclease

12. Which enzyme is used in homopolymer tailing for producing sticky ends ?
- (A) Terminal Deoxynucleotidyl Transferase
 (B) Alkaline Phosphatase
 (C) Polynucleotide Kinase
 (D) DNA Polymerase
13. Which of the following is responsible for the conversion of covalently closed circular DNA to supercoiled DNA of the plasmid ?
- (A) Endonuclease
 (B) DNA Gyrase
 (C) Topoisomerase
 (D) Exonuclease
14. The S1 Nuclease is an endonuclease enzyme that splits single stranded DNA and RNA into oligo- or mononucleotides. The S1 Nuclease is isolated from :
- (A) Mung bean sprouts
 (B) *Aspergillus oryzae*
 (C) *Penicillium citrinum*
 (D) *Alteromonase espejiana*
15. Find the microorganism that can be the source of the restriction endonuclease *AluI* :
- (A) *Escherichia coli*
 (B) *Staphylococcus aureus*
 (C) *Arthrobacter luteus*
 (D) *Haemophilus influenza*
16. Which enzyme is used to join together two different types of DNA molecules ?
- (A) Transferase
 (B) Reverse transcriptase
 (C) Ligase
 (D) DNase
17. The RNA strand in the RNA-DNA hybrid is removed by :
- (A) RNaseH
 (B) RNaseA
 (C) DNase I
 (D) RNA Polymerase
18. Reverse transcriptase is an enzyme used to generate complementary DNA (cDNA) from an mRNA template, a process known as reverse transcription. Reverse transcriptase is also called :
- (A) RNA-dependent RNA polymerase
 (B) DNA-dependent RNA polymerase
 (C) RNA-dependent DNA polymerase
 (D) DNA-dependent DNA polymerase

19. Which of following are the characteristics of the type II restriction enzymes ?
- (P) Cleavage sites : At or near recognition sequence
 - (Q) Requirement for restriction enzyme activity : ATP
 - (R) Cleavage sites : Cleave at 24-26 bp away from recognition site
 - (S) Nature of enzyme : Unifunctional enzyme, two identical subunits
- (A) P and S
 - (B) Q and R
 - (C) P and Q
 - (D) Q and S
20. The complete set of genetic information in an organism is called :
- (A) Gene
 - (B) Genome
 - (C) Genomics
 - (D) Proteome
21. Which of the following statements is incorrect ?
- (A) A library encompassing an entire genome is called a genomic library.
 - (B) Genomic library contains both coding and noncoding DNA
 - (C) A cDNA library is made using mRNA instead of DNA as the starting material.
 - (D) A cDNA library contains both coding and noncoding DNA
22. The *par* region from a plasmid such as pSC101 can be cloned into pBR322. What is the function of this region ?
- (A) Partitioning function and maintains plasmid stability
 - (B) Maintains cloning efficiency
 - (C) Aids in replication
 - (D) None of the above
23. Which of the following part of vector helps in identifying transformed cells ?
- (A) Multiple cloning sites
 - (B) Selectable marker
 - (C) Origin of replication
 - (D) All of the above

24. Which of the following components are required for the 5'- end labeling of DNA with radioactive phosphorous ?
- (A) Terminal deoxynucleotidyl transferase and (gamma) $\gamma - ^{32}\text{P}$ dNTP
- (B) Polynucleotide kinase and (gamma) $\gamma - ^{32}\text{P}$ dNTP
- (C) Terminal deoxynucleotidyl transferase and (alpha) $\alpha - ^{32}\text{P}$ dNTP
- (D) Polynucleotide kinase and (alpha) $\alpha - ^{32}\text{P}$ dNTP
25. How can conjugative and non-conjugative plasmids be differentiated ?
- (A) On the basis of size
- (B) Presence of antibiotic resistance
- (C) Number of restriction sites
- (D) Presence of transfer (*tra*) genes
26. Size of the pBR322 cloning vector is :
- (A) 4.3 Kb
- (B) 1 Kb
- (C) 2.8 Kb
- (D) 10 Kb
27. Plasmid incompatibility is :
- (A) Inhibition of growth of the bacterial host cell by the plasmids
- (B) Ability of two different plasmids to coexist in the same cell in the absence of selection pressure
- (C) Inability of two different plasmids to coexist in the same cell in the absence of selection pressure
- (D) None of the above
28. Which antibiotic resistance is present in pBR322 vector ?
- (A) Ampicillin
- (B) Kanamycin
- (C) Tetracycline
- (D) Both ampicillin and tetracycline
29. Which of the statement is incorrect with respect to Alpha (α -) complementation ?
- (A) One part of the *lacZ* gene (*lacZ'*) is present in the cloning vector
- (B) Another part is present in the host itself
- (C) The cloning vector is moved to host cell and transformants are selected on growth medium in the presence of IPTG, X-gal and antibiotic, blue colonies are observed
- (D) The cloning vector containing insert, is moved to host cell and transformants are selected on growth medium in the presence of IPTG, X-gal and antibiotic, blue colonies are observed

30. A restriction enzyme (*AluI*) has as its recognition sequence 5'- AGTC-3'. Find the number of restriction sites for *AluI* in the genome (7936 bp) of the Cauliflower mosaic virus (CaMV) (assuming that the nucleotides are ordered randomly and the four different nucleotides are present in equal proportions in the CaMV genome).
- (A) 1984
 (B) 124
 (C) 31
 (D) 2
31. Find the microorganism that can be the source of the restriction endonuclease *XhoI* :
- (A) *Xanthomonas oryzae*
 (B) *Xanthomonas campestris*
 (C) *Xanthomonas holicicola*
 (D) *Xanthomonas badrii*
32. The process of introducing DNA molecules into the recipient host organism is known as :
- (A) Translation
 (B) Transformation
 (C) Transduction
 (D) Transcription
33. Circularization of the injected linear phage DNA molecule is facilitated by which of the following ?
- (A) Polyhedral head
 (B) *cos* sites
 (C) Phage tail
 (D) Capsid proteins
34. The phage Lambda (λ) Vectors, Lambda-EMBL3(λ EMBL3)and Lambda-ZAPII (λ ZAPII) are examples of :
- (A) Insertional vector and replacement vector, respectively
 (B) Replacement vector and insertional vector, respectively
 (C) Hybrid vector and Mammalian vector, respectively
 (D) Cosmid and Phagemid, respectively
35. You are given a vector called *Charon 16 A* (Size = 42 Kb) belonging to the class of the λ phage insertion vector. Identify the DNA fragment that cannot be cloned in the *Charon 16 A* vector.
- (A) 3 Kb
 (B) 6 Kb
 (C) 9 Kb
 (D) 12 Kb

36. Which divalent cations are usually used to make competent cells ?
- (A) Lead
 - (B) Cadmium
 - (C) Tin
 - (D) Calcium
37. Find the range of size (Minimum-Maximum) of DNA that can be packaged into a λ phage is :
- (A) 10 Kb – 45 Kb
 - (B) 38 Kb – 52 Kb
 - (C) 70 Kb – 100 Kb
 - (D) 29 Kb – 49 Kb
38. Which of the following statements is incorrect ?
- (A) Conjugative and non-conjugative plasmids be differentiated on the basis of absence and presence of transfer (*tra*) genes
 - (B) The phage Lambda Vector, λ EMBL3, is an example of the replacement vector.
 - (C) Blue-White screening for the recombinant plasmids can be performed using the plasmid pBR322.
 - (D) The pUC vector series was developed at the University of California.
39. The bacteriophage M13 vectors belong to a group of phages called as :
- (A) Filamentous phage
 - (B) M phage group
 - (C) Mu phage group
 - (D) Double stranded phage
40. You are given a Lambda replacement vector of 42 Kb. It contains a central stuffer fragment of 14 Kb. Find the minimum size of the DNA fragment that can be cloned in the given vector :
- (A) 5 Kb
 - (B) 10 Kb
 - (C) 15 Kb
 - (D) 20 Kb
41. Cosmid vectors are :
- (A) Phages that lack *cos* site
 - (B) Plasmids that contain fragment of λ phage DNA including the *cos* site
 - (C) Plasmids that have no selection marker
 - (D) Cryptic plasmids

42. Identify the correct order for the following cloning vectors in terms of cloning capacity :
- (A) Plasmid > Lambda Phage > Cosmid > BAC > YAC
 (B) BAC > YAC > Plasmid > Lambda Phage > Cosmid
 (C) YAC > BAC > Cosmid > Lambda Phage > Plasmid
 (D) BAC > YAC > Lambda Phage > Plasmid > Cosmid
43. A cloning vector, which has both phage and plasmid properties is known as :
- (A) Fosmid
 (B) Phagemid
 (C) YAC
 (D) HAC
44. If a plasmid is having two antibiotic resistant genes, say ampicillin resistant and kanamycin resistant. After successful cloning, if the plasmid grows in ampicillin containing medium but not in kanamycin, what can be concluded ?
- (A) The insert is not present in any of the gene
 (B) The insert is present in ampicillin gene but not in kanamycin gene
 (C) The insert is present in kanamycin gene but not in ampicillin gene
 (D) The insert is present between both of the genes
45. What is the CEN4 region in the YAC (Yeast Artificial Chromosome) ?
- (A) Centromere DNA
 (B) Telomere DNA
 (C) Origin of replication
 (D) Selectable marker
46. What is the function of the *HIS3* gene located on the yeast cloning vectors ?
- (A) Histone modulator
 (B) Histamine biosynthesis
 (C) Histidine biosynthesis
 (D) Required for His-tagged fusion
47. Which of the following statements is incorrect with respect to yeast vectors ?
- (A) Yeast replicating plasmid (YRp) contain an autonomous replicating sequence (ARS)
 (B) Yeast centromere plasmid (YCP) contain both an ARS and a yeast centromere
 (C) Yeast episomal plasmids (YEPs) are shuttle vectors
 (D) Yeast integrative plasmid (YIp) can replicate as a plasmid.
48. Why are copy numbers important in a cloning experiment ?
- (A) Maximum expression
 (B) Ease of manipulation
 (C) Cost efficiency
 (D) Availability of stock

49. Identify the hybrid promoter that is used in the expression vector :
- (A) *araBAD* promoter
 - (B) *tac* promoter
 - (C) *lac* promoter
 - (D) *trp* promoter
50. What are YAC vectors ?
- (A) Yeast artificial vectors
 - (B) Yeast aggregative vectors
 - (C) Yeast artificial chromosomes
 - (D) Yeast aggregative chromosomes
51. What will happen if the incubation period, post restriction digestion is shortened ?
- (A) Indigestion
 - (B) Partial digestion
 - (C) Double digestion
 - (D) Complete digestion
52. The Ti (tumor inducing) plasmid is found in :
- (A) *Agrobacterium*
 - (B) Yeast as a 2-micron plasmid
 - (C) *Rhizobium*
 - (D) *Azotobacter*
53. What are the origins of replication ?
- (A) Gene component
 - (B) Initiation sites
 - (C) Initiation codons
 - (D) Stop codons
54. The *vir* genes required for the T-DNA transfer are located :
- (A) Within the T-DNA region of the Ti plasmid
 - (B) Outside of the T-DNA region of the Ti plasmid
 - (C) On the plant genome
 - (D) On the chloroplast genome
55. Ti plasmid directs the formation of transfer apparatus which allow the transfer of T-DNA into the host plant. The transfer apparatus belong to the class of ?
- (A) Type I secretion system
 - (B) Type II secretion system
 - (C) Type III secretion system
 - (D) Type IV secretion system
56. Identify the genes that encode for a two-component signal system that drive the expression of other *vir* genes of Ti plasmid via sensing plant-derived signals such as plant phenolics and monosaccharides :
- (A) *virD* and *virE*
 - (B) *virC1* and *virC2*
 - (C) *virA* and *virG*
 - (D) *virB* and *virD*

57. "FlavrSavr" is genetically engineered tomato that shows :
- (A) Longer shelf life
 - (B) Delayed ripening
 - (C) Enhanced flavor
 - (D) None of the above
58. Which of the following statements is incorrect with respect to T-DNA binary vector system ?
- (A) The *vir* genes and the disarmed T-DNA containing the transgene are located on separate plasmids.
 - (B) The *vir* functions are supplied *in trans*, causing transfer of the recombinant T-DNA to the plant genome.
 - (C) Mini-Ti plasmid and helper Ti plasmid forms T-DNA binary vector system.
 - (D) Gene of interest (transgene) is cloned in the helper Ti plasmid
59. Disarmed Ti vectors do not contain :
- (A) Oncogenes located in the T-DNA region
 - (B) Opine catabolic genes
 - (C) *vir* genes
 - (D) Left and right border sequences
60. Identify the DNA virus that have been developed as vector for the gene transfer to the plant cell :
- (A) Tobacco mosaic virus
 - (B) Cauliflower mosaic virus
 - (C) Brome mosaic virus
 - (D) Potato virus X
61. Which of the following statements is incorrect with respect to Liposome-mediated gene delivery to plant cells ?
- (A) Enhanced delivery of encapsulated DNA by membrane fusion
 - (B) This method makes encapsulated DNA prone to nuclease activity
 - (C) Involves fusion of liposomes with protoplast
 - (D) None of the above
62. Gene transfer across the protoplast membrane is promoted by :
- (A) Phenol
 - (B) Benzoic acid
 - (C) Polyethylene glycol
 - (D) Naphthalene

63. The first human protein produced through recombinant DNA technology is :
- (A) Insulin
(B) Interferon
(C) Somatostatin
(D) Erythropoietin
64. In which region in the YAC vector is the new DNA inserted in a cloning experiment ?
- (A) TEL
(B) CEN4
(C) ARS
(D) SUP4
65. The first transgenic plant was :
- (A) Tobacco
(B) Rice
(C) Tomato
(D) Cotton
66. A transgenic plant “Golden Rice” contains foreign genes that produce :
- (A) Niacin
(B) Biotin
(C) Beta-carotene (β -carotene)
(D) Yellow fluorescent protein
67. What are opines ?
- (A) Bacterial nutrients
(B) Plant nutrients
(C) Telomere sites
(D) T-DNA ends
68. In a plant tumor cell :
- (A) Complete Ti plasmid is incorporated in plant nuclear DNA
(B) Different parts of the Ti-plasmid are incorporated
(C) Only a small specific segment of the Ti-plasmid (T-DNA) is incorporated
(D) Complete Ti plasmid is incorporated in the plant chloroplast DNA
69. Molecular farming is involved in :
- (A) Crop improvement
(B) Production of metabolites
(C) Therapeutics proteins
(D) All of the above
70. What is name of an antibody that is produced by plants that have been genetically engineered with DNA encoding a specific human antibody ?
- (A) Plantibody
(B) Edible vaccine
(C) Immunoglobulin
(D) Immunobody

71. Generation of recombinant DNA involves :
- (A) Cleaving and rejoining DNA segments with ligase alone
 - (B) Cleaving DNA segments with ligase and rejoining them with restriction endonuclease
 - (C) Cleaving and rejoining DNA segments with restriction endonuclease alone
 - (D) Cleaving DNA segments with restriction endonuclease and rejoining them with ligase
72. Transformation carried out using a particle gun is known as biolistic transformation. It falls under which category of transformation ?
- (A) Physical
 - (B) Chemical
 - (C) Electroporation
 - (D) Natural
73. How many phage particles are released per generation upon coliphage infection ?
- (A) 10
 - (B) 100
 - (C) 500
 - (D) 1000
74. Embryonic stem cells are :
- (A) Totipotent stem cells
 - (B) Pluripotent stem cells
 - (C) Multipotent stem cells
 - (D) Omnipotent stem cells
75. Antibiotics are used in recombinant DNA technology. They are used :
- (A) To keep culture free of microbial infections
 - (B) To promote the ligation between foreign DNA and vector
 - (C) To initiate the replication of vectors
 - (D) As selectable markers
76. Which of the following is the basic requirement of PCR reaction ?
- (A) Two oligonucleotide primers
 - (B) DNA segment to be amplified
 - (C) A heat-stable DNA polymerase
 - (D) All of the above

77. In pronuclear microinjection method
- (A) The transgene is injected in to the female pronucleus just after fertilization
 - (B) The transgene is injected in to the male pronucleus just after fertilization
 - (C) Electric impulse is used for the DNA injection
 - (D) The transgene is injected in to the embryonic stem cells
78. Using the Wallace rule, find the T_m ($^{\circ}\text{C}$) for the Primer : 5'-CCTGGACAATGTACCATA-3'.
- (A) 56
 - (B) 52
 - (C) 48
 - (D) 42
79. Dolly is the name of the :
- (A) First cloned sheep
 - (B) First cloned monkey
 - (C) First test-tube baby
 - (D) First human fos
80. Phage display technique makes use of which of the following vectors ?
- (A) M13
 - (B) Lambda
 - (C) 2 micron circle
 - (D) BAC
81. Polymerase used for PCR is extracted from :
- (A) *Escherichia coli*
 - (B) *Homo sapiens*
 - (C) *Thermus aquaticus*
 - (D) *Saccharomyces cerevisiae*
82. The inheritance pattern of RFLP markers is :
- (A) Dominant
 - (B) Recessive
 - (C) Co-dominant
 - (D) Random
83. Western blotting is the technique for the detection of :
- (A) Specific protein in the sample
 - (B) Specific DNA in the sample
 - (C) Specific RNA in the sample
 - (D) Specific glycolipid in the sample

84. Klenow fragment is the modified enzyme of which of the parent DNA polymerase ?
- (A) DNA Polymerase I
 - (B) DNA Polymerase II
 - (C) DNA Polymerase III
 - (D) DNA Polymerase IV
85. Which of the following is untrue regarding the classic yeast two-hybrid method ?
- (A) It is used for the detection of Protein interactions
 - (B) Method that relies on the interaction of “bait” and “prey” proteins in molecular constructs in yeast
 - (C) DNA-binding domain and a trans-activation domain don't necessarily interact
 - (D) In this strategy, a two-domain transcriptional activator is employed as a helper for determining protein-protein interactions
86. A molecular technique in which DNA sequences between two oligonucleotide primers can be amplified is known as :
- (A) Southern blotting
 - (B) Northern blotting
 - (C) Polymerase chain reaction
 - (D) DNA replication
87. The Southern blotting technique depends on :
- (A) Similarities between the sequences of probe DNA and experimental DNA
 - (B) Similarities between the sequences of probe RNA and experimental RNA
 - (C) Similarities between the sequences of probe protein and experimental protein
 - (D) The molecular mass of proteins
88. From which organism is the enzyme reverse transcriptase isolated ?
- (A) Bacteria
 - (B) Fungi
 - (C) Virus
 - (D) Prions

89. Identify the label used for the generation of non-radioactive hybridization probes :
- (A) Fluorescein
 - (B) Biotin
 - (C) Digoxigenin
 - (D) All of the above
90. Nucleic acids are readily labeled with tags that facilitate detection or purification. Which of the following components are required for the 3'- end labeling of DNA with radioactive phosphorous ?
- (A) Terminal deoxynucleotidyl transferase and (gamma) $\gamma - ^{32}\text{P}$ dNTP
 - (B) Polynucleotide kinase and (gamma) $\gamma - ^{32}\text{P}$ dNTP
 - (C) Terminal deoxynucleotidyl transferase and (alpha) $\alpha - ^{32}\text{P}$ dNTP
 - (D) Polynucleotide kinase and (alpha) $\alpha - ^{32}\text{P}$ dNTP
91. The process by which a probe is used to screen a library is known as
- (A) FISH
 - (B) Southern blotting
 - (C) Colony hybridization
 - (D) Western blotting
92. Reverse transcription PCR uses :
- (A) Protein as a template to form cDNA
 - (B) mRNA as a template to form cDNA
 - (C) DNA as a template to form single stranded DNA
 - (D) All of the above
93. A dye called "SYBR Green" is used in :
- (A) Nested PCR
 - (B) Inverse PCR
 - (C) Anchored PCR
 - (D) Real-Time PCR
94. Expression vectors have been engineered so that the protein being expressed is fused to another protein, called a *tag*, which can be used to facilitate protein purification. Which of the following statements is correct with respect to protein *tag* ?
- (A) Recombinant proteins that have Glutathione S-transferase (GST) tags are purified using amylose columns
 - (B) MBP (Maltose binding protein)-tagged fusion proteins are purified via immobilized metal ion affinity chromatography
 - (C) His-tagged fusion proteins can easily be purified by Ni-NTA affinity resin
 - (D) Glutathione sepharose resins are often used for purification of MBP (Maltose binding protein)-tagged fusion proteins

95. What form does the phage DNA take when it is injected into the host ?
- (A) Linear
(B) Circular
(C) Double helical
(D) Supercoiled
96. If any protein-encoding gene is expressed in a heterologous host, it is called a :
- (A) Pure protein
(B) Mixed protein
(C) Recombinant protein
(D) Similar protein
97. Which of the following statements is incorrect with respect to Embryonic Stem (ES) cells ?
- (A) Inner cell mass of the blastocyst is the source of ES cells
(B) ES cells are multipotent stem cells
(C) ES cells can be cultured in medium
(D) ES cells can give rise to all cell types except placenta
98. Which of the following is the correct order of steps when performing a southern blot after isolation of the DNA ?
- (A) Probe hybridization, restriction enzyme digestion, denaturation, electrophoresis
(B) Denaturation, electrophoresis, probe hybridization, restriction enzyme digestion
(C) Restriction enzyme digestion, electrophoresis, denaturation, probe hybridization
(D) Electrophoresis, Restriction enzyme digestion, probe hybridization, denaturation
99. The 2 micrometer circle found in yeast is a
- (A) Phage
(B) Plasmid
(C) Virus
(D) Gene product
100. Which of the following is a high copy number plasmid ?
- (A) Conjugative plasmids
(B) Stringent plasmids
(C) Non-conjugative plasmids
(D) F-plasmid

4. Four alternative answers are mentioned for each question as—A, B, C & D in the booklet. The candidate has to choose the correct answer and mark the same in the OMR Answer-Sheet as per the direction :

Example :

Question :

Q. 1 (A) ● (C) (D)

Q. 2 (A) (B) ● (D)

Q. 3 (A) ● (C) (D)

Illegible answers with cutting and over-writing or half filled circle will be cancelled.

5. Each question carries equal marks. Marks will be awarded according to the number of correct answers you have.
6. All answers are to be given on OMR Answer sheet only. Answers given anywhere other than the place specified in the answer sheet will not be considered valid.
7. Before writing anything on the OMR Answer Sheet, all the instructions given in it should be read carefully.
8. After the completion of the examination candidates should leave the examination hall only after providing their OMR Answer Sheet to the invigilator. Candidate can carry their Question Booklet.
9. There will be no negative marking.
10. Rough work, if any, should be done on the blank pages provided for the purpose in the booklet.
11. To bring and use of log-book, calculator, pager and cellular phone in examination hall is prohibited.
12. In case of any difference found in English and Hindi version of the question, the English version of the question will be held authentic.

Impt. : On opening the question booklet, first check that all the pages of the question booklet are printed properly. If there is any discrepancy in the question Booklet, then after showing it to the invigilator, get another question Booklet of the same series.

4. प्रश्न-पुस्तिका में प्रत्येक प्रश्न के चार सम्भावित उत्तर—A, B, C एवं D हैं। परीक्षार्थी को उन चारों विकल्पों में से सही उत्तर छँटना है। उत्तर को OMR आन्सर-शीट में सम्बन्धित प्रश्न संख्या में निम्न प्रकार भरना है :

उदाहरण :

प्रश्न :

प्रश्न 1 (A) ● (C) (D)

प्रश्न 2 (A) (B) ● (D)

प्रश्न 3 (A) ● (C) (D)

अपठनीय उत्तर या ऐसे उत्तर जिन्हें काटा या बदला गया है, या गोले में आधा भरकर दिया गया, उन्हें निरस्त कर दिया जाएगा।

5. प्रत्येक प्रश्न के अंक समान हैं। आपके जितने उत्तर सही होंगे, उन्हीं के अनुसार अंक प्रदान किये जायेंगे।
6. सभी उत्तर केवल ओ. एम. आर. उत्तर-पत्रक (OMR Answer Sheet) पर ही दिये जाने हैं। उत्तर-पत्रक में निर्धारित स्थान के अलावा अन्यत्र कहीं पर दिया गया उत्तर मान्य नहीं होगा।
7. ओ. एम. आर. उत्तर-पत्रक (OMR Answer Sheet) पर कुछ भी लिखने से पूर्व उसमें दिये गये सभी अनुदेशों को सावधानीपूर्वक पढ़ लिया जाये।
8. परीक्षा समाप्ति के उपरान्त परीक्षार्थी कक्ष निरीक्षक को अपनी OMR Answer Sheet उपलब्ध कराने के बाद ही परीक्षा कक्ष से प्रस्थान करें। परीक्षार्थी अपने साथ प्रश्न-पुस्तिका ले जा सकते हैं।
9. निगेटिव मार्किंग नहीं है।
10. कोई भी रफ कार्य, प्रश्न-पुस्तिका के अन्त में, रफ-कार्य के लिए दिए खाली पेज पर ही किया जाना चाहिए।
11. परीक्षा-कक्ष में लॉग-बुक, कैलकुलेटर, पेजर तथा सेल्युलर फोन ले जाना तथा उसका उपयोग करना वर्जित है।
12. प्रश्न के हिन्दी एवं अंग्रेजी रूपान्तरण में भिन्नता होने की दशा में प्रश्न का अंग्रेजी रूपान्तरण ही मान्य होगा।

महत्वपूर्ण : प्रश्नपुस्तिका खोलने पर प्रथमतः जाँच कर देख लें कि प्रश्न-पुस्तिका के सभी पृष्ठ भलीभाँति छपे हुए हैं। यदि प्रश्नपुस्तिका में कोई कमी हो, तो कक्षनिरीक्षक को दिखाकर उसी सिरीज की दूसरी प्रश्न-पुस्तिका प्राप्त कर लें।