Roll No. .....

Question Booklet Number

O. M. R. Serial No.

M. Sc. (Microbiology) (Second Semester) EXAMINATION, 2025-26

(Old Syllabus Effective from 2022)

(Only Back Paper Students)

FUNDAMENTALS OF MOLECULAR BIOLOGY

Paper Code							
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Questions Booklet Series
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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. RNA editing modifies :

(A) DNA

(B) Lipid

(C) Protein

(D) RNA sequence

2. hnRNA is :

(A) Pre-mRNA

(B) Mature RNA

(C) tRNA

(D) rRNA

3. Enhancers act :

(A) Inside gene

(B) Only upstream

(C) Only downstream

(D) Upstream or downstream

4. Transcription termination in prokaryotes involves :

(A) Primase

(B) Ligase

(C) Helicase

(D) Rho factor

5. Polyadenylation occurs at :

(A) 5′ end of mRNA

(B) 3′ end of mRNA

(C) Middle of mRNA

(D) Random

6. RNA pol I synthesizes :

(A) rRNA

(B) mRNA

(C) tRNA

(D) snRNA

7. Spliceosome consists of :

(A) DNA

(B) Proteins only

(C) snRNPs + Protein

(D) Lipids

8. mRNA capping occurs at :

(A) 3′ end of mRNA

(B) 5′ end of mRNA

(C) Middle of mRNA

(D) Random

9. TATA box is recognized by :

(A) TFIIH

(B) RNA pol II

(C) TBP

(D) Ligase

10. RNA polymerase binds to :

(A) Terminator

(B) Enhancer

(C) Operator

(D) Promoter

11. RecBCD pathway is involved in :

(A) Replication

(B) Repair

(C) Recombination

(D) Transcription

12. SOS response is triggered by :

(A) Protein damage

(B) RNA damage

(C) DNA damage

(D) Lipid damage

13. Beta clamp increases :

(A) Speed

(B) Processivity

(C) Accuracy

(D) Stability

14. Helicase unwinds DNA using :

(A) ATP

(B) GTP

(C) CTP

(D) UTP

15. Site-specific recombination involves :

(A) Homologous sequences

(B) Specific sequences

(C) Random sequences

(D) RNA

16. Topoisomerase I cuts :

(A) Both strands

(B) One strand

(C) RNA

(D) Protein

17. Primase synthesizes :

(A) DNA

(B) Protein

(C) RNA primer

(D) Lipid

18. Replication fork is :

(A) Protein complex

(B) Circular

(C) Linear

(D) Y-shaped structure

19. Mismatch repair recognizes :

(A) Old strand

(B) New strand

(C) RNA

(D) Protein

20. DNA ligase forms :

(A) Hydrogen bonds

(B) Ionic bonds

(C) Phosphodiester bonds

(D) Peptide bonds

21. Leading strand synthesis is :

(A) Bidirectional

(B) Discontinuous

(C) Continuous

(D) Random

22. Rolling circle replication occurs in :

(A) Bacteriophage T4

(B) Eukaryotes

(C) Ribosomes

(D) Lysosomes

23. Homologous recombination requires :

(A) RecA protein

(B) Ligase

(C) Primase

(D) Helicase

24. Nucleotide excision repair removes :

(A) Single mismatch

(B) Double-strand breaks

(C) Bulky lesions

(D) RNA

25. Telomerase contains :

(A) DNA template

(B) RNA template

(C) Protein only

(D) Lipid

26. Origin recognition complex (ORC) is found in :

(A) Prokaryotes

(B) Eukaryotes

(C) Viruses

(D) Mitochondria

27. Which enzyme removes RNA primers ?

(A) Topoisomerase

(B) DNA pol III

(C) Helicase

(D) DNA polymerase I

28. Okazaki fragments are synthesized on :

(A) Leading strand

(B) Lagging strand

(C) Both strands

(D) RNA

29. Fidelity of DNA replication is mainly due to :

(A) Ligase

(B) Primase

(C) Proofreading activity

(D) Helicase

30. Replicon is defined as :

(A) Protein complex

(B) Whole genome

(C) RNA segment

(D) DNA segment replicated from one origin

31. DNA hybridization requires :

(A) Denaturation and annealing

(B) Translation

(C) Replication

(D) Mutation

32. B-DNA has :

(A) 8 bp/turn

(B) 10 bp/turn

(C) 12 bp/turn

(D) 14 bp/turn

33. DNA helicity changes during :

(A) Replication

(B) Transcription

(C) Supercoiling

(D) All of the above

34. Ethidium bromide intercalates into DNA causing :

(A) Shortening

(B) Methylation

(C) Breaking

(D) Unwinding

35. Where does DNA replication begin in a prokaryotic cell ?

(A) At telomeres

(B) At centromeres

(C) At origins of replication (oriC)

(D) At random locations along the chromosome

36. DNA reassociation rate is fastest in :

(A) Unique sequences

(B) Repetitive sequences

(C) Introns

(D) Exons

37. Palindromic sequences are important in :

(A) Replication only

(B) Translation

(C) Restriction enzyme recognition

(D) Splicing

38. DNA melting is monitored by :

(A) Fluorescence

(B) Mass spectrometry

(C) Infrared

(D) UV absorbance at 260 nm

39. Meselson-Stahl experiment proved :

(A) Conservative replication

(B) Dispersive replication

(C) Semi-conservative replication

(D) Random replication

40. Which metal ion is critical for the catalytic activity and fidelity of DNA polymerases ?

(A) Calcium (Ca^{2+})

(B) Magnesium (Mg^{2+})

(C) Sodium (Na^{+})

(D) Potassium (K^{+})

41. DNA hybridization specificity depends on :

(A) Sequence complementarity

(B) Length only

(C) Temperature only

(D) Enzymes

42. Denaturation temperature increases with :

(A) AT content

(B) GC content

(C) RNA contamination

(D) Protein binding

43. A nick in DNA refers to :

(A) Double-strand break

(B) Missing base

(C) Single-strand break

(D) RNA insertion

44. Which bond stabilizes DNA secondary structure most significantly ?

(A) Covalent bonds

(B) Ionic bonds

(C) Hydrogen bonds + base stacking

(D) Peptide bonds

45. Cot curve analysis is used to determine :

(A) DNA replication rate

(B) RNA splicing

(C) Protein synthesis rate

(D) Genome complexity

46. DNA renaturation kinetics depends on :

(A) Protein content

(B) Genome complexity

(C) Lipid content

(D) RNA length

47. In Z-DNA, the helix is :

(A) Right-handed with 10 bp/turn

(B) Linear structure

(C) Right-handed with 11 bp/turn

(D) Left-handed with zig-zag backbone

48. Supercoiling in circular DNA is primarily regulated by :

(A) Helicase

(B) Ligase

(C) Topoisomerase

(D) Primase

49. The hyperchromic effect during DNA denaturation is due to :

(A) Hydrogen bond formation

(B) Base stacking disruption

(C) Phosphodiester bond cleavage

(D) RNA contamination

50. Which experiment provided direct evidence that DNA is the genetic material ?

(A) Hershey-Chase experiment

(B) Meselson-Stahl experiment

(C) Griffith transformation

(D) Avery-MacLeod-McCarty

51. Gene expression is controlled at :

(A) Multiple levels

(B) Single level

(C) DNA only

(D) RNA only

52. Zinc finger proteins bind :

(A) DNA

(B) RNA

(C) Lipid

(D) Protein

53. CpG islands are associated with :

(A) tRNA

(B) Introns

(C) Exons

(D) Promoters

54. miRNA regulates :

(A) DNA repair

(B) Replication

(C) Translation

(D) Recombination

55. Insulators block :

(A) Mutation

(B) Replication

(C) Translation

(D) Enhancer action

56. Heterochromatin is :

(A) Active

(B) Inactive

(C) Open

(D) Transcribed

57. Euchromatin is :

(A) Active

(B) Inactive

(C) Condensed

(D) Silent

58. Response (Promoter) elements bind :

(A) DNA

(B) RNA

(C) Transcription factors

(D) Protein

59. Histone acetylation generally leads to :

(A) Repression

(B) Activation

(C) Mutation

(D) Deletion

60. Operon concept was proposed by :

(A) Mendel

(B) Watson and Crick

(C) Darwin

(D) Jacob and Monod

61. siRNA functions in :

(A) Mutation

(B) Replication

(C) Translation

(D) Gene silencing

62. Epigenetics involves :

(A) DNA sequence change

(B) Protein change

(C) Histone modification

(D) Lipid change

63. Gene silencing occurs via :

(A) DNA methylation

(B) Replication

(C) Translation

(D) Mutation

64. Chromatin remodeling involves :

(A) Protein synthesis

(B) DNA cleavage

(C) RNA synthesis

(D) Histone modification

65. Enhancers bind :

(A) Polymerase

(B) Repressors

(C) Activators

(D) Ribosome

66. Ara operon regulation involves gene :

(A) AraC

(B) CAP

(C) LacI

(D) TrpR

67. Operator site of Lac Operon binds :

(A) Activator

(B) Repressor

(C) Polymerase

(D) Ribosome

68. CAP protein binds when :

(A) Glucose is high

(B) Lactose is absent

(C) Glucose is low

(D) RNA is present

69. Trp operon is :

(A) Inducible

(B) Repressible

(C) Constitutive

(D) Inactive

70. Lac operon is inducible by :

(A) Fructose

(B) Glucose

(C) Galactose

(D) Lactose

71. Translation requires :

(A) ATP/GTP

(B) DNA

(C) Lipid

(D) Protein

72. Ribosomal sites are :

(A) A, P, E

(B) X, Y, Z

(C) L, M, N

(D) None of the above

73. Anticodon is present on :

(A) mRNA

(B) tRNA

(C) rRNA

(D) DNA

74. Codon is composed of :

(A) 5 bases

(B) 2 bases

(C) 4 bases

(D) 3 bases

75. Protein trafficking involves :

(A) Lipid

(B) DNA

(C) RNA

(D) Signal sequences

76. Polysome refers to :

(A) Multiple ribosomes

(B) Single ribosome

(C) DNA

(D) RNA

77. Chemical Proofreading in translation occurs by :

(A) Ribosome

(B) DNA

(C) tRNA synthetase

(D) RNA

78. Initiation factors (IF-I, IF-II, IF-III) help in :

(A) Mutation

(B) DNA synthesis

(C) RNA synthesis

(D) Ribosome assembly

79. Genetic code is :

(A) Overlapping

(B) Non-overlapping

(C) Ambiguous

(D) Variable

80. tRNA structure is :

(A) Cloverleaf

(B) Linear

(C) Circular

(D) Helical

81. Signal peptide directs protein to :

(A) Nucleus

(B) ER

(C) Cytoplasm

(D) Golgi

82. The post-translational modification includes :

(A) Phosphorylation

(B) Replication

(C) Transcription

(D) Splicing

83. Wobble hypothesis explains :

(A) Splicing

(B) Mutation

(C) Replication

(D) Codon degeneracy

84. Stop codon is recognized by :

(A) tRNA

(B) Ribosome

(C) Release factor

(D) Ligase

85. Elongation factor EF-Tu binds :

(A) ATP

(B) GTP

(C) CTP

(D) UTP

86. Peptidyl transferase activity is by :

(A) Lipid

(B) Protein

(C) DNA

(D) rRNA

87. Shine-Dalgarno sequence is in :

(A) Eukaryotes

(B) Prokaryotes

(C) Viruses

(D) Mitochondria

88. Aminoacyl-tRNA synthetase ensures :

(A) Speed of translation

(B) Stability of mRNA

(C) Accuracy of translation

(D) Folding of protein

89. Start codon is :

(A) UAA

(B) UAG

(C) AUG

(D) UGA

90. Ribosome has :

(A) rRNA + protein

(B) DNA

(C) Lipid

(D) Carbohydrate

91. Rho independent transcription termination signal includes :

(A) Hairpin loop

(B) Protein

(C) Lipid

(D) DNA

92. Cap structure is :

(A) UTP

(B) ATP

(C) GTP

(D) m7G

93. Promoter strength depends on :

(A) Sequence

(B) Length

(C) Protein

(D) Lipid

94. RNA pol III synthesizes :

(A) tRNA

(B) rRNA

(C) mRNA

(D) DNA

95. snRNA function is :

(A) Translation

(B) Replication

(C) Splicing

(D) Mutation

96. Sigma factor is involved in transcription :

(A) Initiation

(B) Elongation

(C) Termination

(D) Splicing

97. Transcription inhibitors target :

(A) DNA

(B) RNA polymerase

(C) Protein

(D) Lipid

98. RNA transport occurs through :

(A) Golgi

(B) Ribosomes

(C) Lysosomes

(D) Nuclear pores

99. Alternative splicing produces :

(A) Multiple proteins

(B) Same protein

(C) DNA

(D) Lipid

100. Introns are removed by :

(A) Mutation

(B) Translation

(C) Replication

(D) Splicing

(Only for Rough Work)

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 छाँटना 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।