**Roll No. .....**

| Question Booklet Number |
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**O. M. R. Serial No.**

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# M. Sc. (Biotechnology) (Second Semester)
# (NEP) EXAMINATION, 2025-26
## MOLECULAR BIOLOGY AND GENETICS

| Paper Code | | | | | | |
|---|---|---|---|---|---|---|
| L | 0 | 3 | 0 | 8 | 0 | 1 | T |

| Questions Booklet Series |
|---|
| D |

*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. Frameshift mutation affects :

(A) Single amino acid

(B) Only stop codon

(C) Entire downstream sequence

(D) Only start codon

2. Stop codon recognition involves :

(A) tRNA

(B) Ligase

(C) rRNA

(D) Release factor

3. Which antibiotic blocks translocation ?

(A) Tetracycline

(B) Chloramphenicol

(C) Erythromycin

(D) Streptomycin

4. Translocation of ribosome on mRNA requires :

(A) ATP

(B) NADH

(C) GTP

(D) $FADH_2$

5. Peptidyl transferase activity resides in :

(A) Protein enzyme

(B) DNA

(C) tRNA

(D) rRNA (ribozyme)

6. In eukaryotes, Kozak sequence functions in :

(A) Termination

(B) Initiation

(C) Elongation

(D) Splicing

7. Shine-Dalgarno sequence is recognized by :

(A) 50S subunit

(B) Initiation factor IF2

(C) tRNA

(D) 16S rRNA

8. Wobble base pairing occurs between :

(A) First codon-first anticodon

(B) Second codon-second anticodon

(C) Third codon-first anticodon

(D) First codon-third anticodon

9. Mis-acylation of tRNA leads to :

(A) Wrong codon recognition

(B) Incorrect amino acid incorporation

(C) Ribosome stalling

(D) mRNA degradation

10. The fidelity of translation is primarily ensured by :

(A) Ribosomal RNA

(B) Initiation factors

(C) Aminoacyl-tRNA synthetase

(D) Peptidyl transferase

11. RNA Pol I synthesizes :

(A) mRNA

(B) snRNA

(C) tRNA

(D) rRNA

12. TATA box is recognized by :

(A) TBP

(B) RNA Pol

(C) Ligase

(D) Helicase

13. mRNA stability depends on :

(A) Poly-A tail

(B) Cap

(C) Both (A) and (B)

(D) None of the above

14. Enhancers act :

(A) Upstream/downstream

(B) Only upstream

(C) Only downstream

(D) None of the above

15. Transcription direction is :

(A) 3′-5′

(B) 5′-3′

(C) Both (A) and (B)

(D) None of the above

16. Spliceosome contains :

(A) DNA

(B) Lipid

(C) Protein only

(D) RNA + protein

17. Introns are removed in :

(A) Cytoplasm

(B) Ribosome

(C) Nucleus

(D) ER

18. mRNA export requires :

(A) Ribosome

(B) Ligase

(C) Transport proteins

(D) Helicase

19. CTD tail of RNA Pol II is involved in :

(A) Replication

(B) Repair

(C) Translation

(D) RNA processing

20. Transcription bubble size is about :

(A) 5 bp

(B) 17 bp

(C) 50 bp

(D) 100 bp

21. The Rho-independent termination involves :

(A) Protein

(B) Ligase

(C) DNA break

(D) Hairpin loop

22. RNA editing involves :

(A) Base substitution

(B) Base insertion/deletion

(C) Both (A) and (B)

(D) None of the above

23. snRNPs recognize :

(A) Exons

(B) Splice sites

(C) Promoters

(D) Terminators

24. Poly-A tail is added by :

(A) RNA polymerase

(B) Ligase

(C) Poly-A polymerase

(D) Helicase

25. Alternative splicing increases :

(A) DNA content

(B) Stability

(C) RNA length

(D) Protein diversity

26. 5′ cap protects mRNA from :

(A) Polymerase

(B) Exonuclease

(C) Ligase

(D) Helicase

27. Eukaryotic RNA Pol II transcribes :

(A) rRNA

(B) tRNA

(C) mRNA

(D) U6snRNA

28. Rho protein functions as :

(A) Helicase

(B) Ligase

(C) Polymerase

(D) Repressor

29. RNA polymerase lacks :

(A) Catalytic activity

(B) Movement along DNA

(C) Binding to DNA

(D) Proofreading

30. Sigma factor recognizes :

(A) Terminator

(B) Promoter

(C) Enhancer

(D) Operator

31. DNA Pol II is mainly involved in :

(A) Replication

(B) Transcription

(C) Repair

(D) Translation

32. Helicase moves along DNA in :

(A) $3' \rightarrow 5'$

(B) $5' \rightarrow 3'$

(C) Both (A) and (B)

(D) Random

33. Which enzyme prevents supercoiling ahead of the replication fork during replication ?

(A) Helicase

(B) Ligase

(C) Topoisomerase

(D) Primase

34. BER removes :

(A) Bulky lesions

(B) RNA

(C) Large deletions

(D) Single damaged base

35. DNA Pol III proofreading direction :

(A) 5′-3′

(B) 3′-5′

(C) Both (A) and (B)

(D) None of the above

36. Okazaki fragments require :

(A) One primer

(B) No primer

(C) Multiple primers

(D) DNA primer only

37. Telomerase is active in :

(A) Somatic cells

(B) Germ cells

(C) RBC

(D) Platelets

38. Replication origin in bacteria is rich in :

(A) GC

(B) CG

(C) AU

(D) AT

39. Nucleotide excision repair recognizes :

(A) Base mismatch

(B) Protein error

(C) RNA damage

(D) Helix distortion

40. Beta clamp is involved in :

(A) Initiation

(B) Elongation

(C) Termination

(D) Repair

41. DNA ligase uses :

(A) ATP

(B) NAD (prokaryotes)

(C) Both (A) and (B)

(D) None of the above

42. Fidelity of DNA replication is highest due to :

(A) Speed

(B) Proofreading + mismatch repair

(C) Ligase

(D) Helicase

43. Primosome includes :

(A) Exonuclease

(B) Ligase + polymerase

(C) RNA + DNA

(D) Primase + helicase

44. Leading strand synthesis is continuous due to :

(A) Same direction as fork

(B) Opposite direction

(C) No primer

(D) No enzyme

45. SOS response is induced by :

(A) DNA damage

(B) RNA damage

(C) Protein folding

(D) Lipid damage

46. Which repair mechanism removes thymine dimers in dark ?

(A) Photoreactivation

(B) BER

(C) NER

(D) SOS

47. Sliding clamp increases :

(A) Fidelity

(B) Processivity

(C) Speed only

(D) Proofreading

48. Okazaki fragment length in eukaryotes is shorter because of :

(A) Faster replication

(B) More ligase

(C) Higher temperature

(D) Chromatin structure

49. In prokaryotes, leading and lagging strand synthesis are coordinated by :

(A) Single polymerase

(B) Helicase

(C) Ligase

(D) Dimeric DNA Pol III holoenzyme

50. Which enzyme has both 5′-3′ polymerase and 5′-3′ exonuclease activity ?

(A) DNA Pol I

(B) DNA Pol III

(C) Ligase

(D) Primase

51. Population genetics studies :

(A) Single gene

(B) Gene frequency

(C) DNA structure

(D) Protein

52. Crossing over increases :

(A) Variation

(B) Mutation

(C) Stability

(D) Repair

53. Three-point test cross determines :

(A) Gene order

(B) Mutation

(C) Replication

(D) Transcription

54. Linked genes are :

(A) On same chromosome

(B) On different chromosomes

(C) Random

(D) Unrelated

55. Genetic distance is proportional to :

(A) Mutation rate

(B) Recombination frequency

(C) Replication

(D) Transcription

56. Sex determination type in humans is :

(A) XO

(B) Haploid

(C) ZW

(D) XY

57. Double crossover affects :

(A) Mapping accuracy

(B) Mutation

(C) Replication

(D) Transcription

58. Crossing over produces :

(A) Parental types

(B) Recombinant types

(C) Mutants

(D) None of the above

59. Recombination mapping assumes :

(A) Independent assortment

(B) DNA repair

(C) Random mutation

(D) Linear gene arrangement

60. Holandric inheritance is :

(A) X-linked

(B) Y-linked

(C) Autosomal

(D) Mitochondrial

61. Dosage compensation ensures :

(A) Equal gene expression

(B) Mutation

(C) Replication

(D) Transcription stop

62. Barr body is :

(A) Active X

(B) Inactive X

(C) Y chromosome

(D) DNA fragment

63. X-inactivation is :

(A) Random

(B) Fixed

(C) Permanent

(D) Temporary

64. Sex-linked traits are on :

(A) Autosomes

(B) Mitochondria

(C) Sex chromosomes

(D) RNA

65. Interference affects :

(A) Crossing over frequency

(B) Mutation

(C) Replication

(D) Transcription

66. Complete linkage means :

(A) 0% recombination

(B) 50% recombination

(C) 100% recombination

(D) Random

67. Genetic Map distance unit is :

(A) Morgan

(B) Centimorgan

(C) Base pair

(D) Dalton

68. Crossing over occurs during :

(A) Prophase I

(B) Metaphase

(C) Anaphase

(D) Telophase

69. Recombination frequency is :

(A) Always less than or equal to 50%

(B) Always greater than 50%

(C) Always 100%

(D) Zero

70. Linkage reduces :

(A) Recombination

(B) Mutation

(C) Replication

(D) Transcription

71. Trans-acting factors are :

(A) DNA

(B) Lipids

(C) Proteins

(D) RNA only

72. Cis-elements are :

(A) Proteins

(B) Lipids

(C) RNA

(D) DNA sequences

73. RNAi pathway involves :

(A) Dicer enzyme

(B) Ligase

(C) Polymerase

(D) Helicase

74. Promoter strength affects :

(A) Translation

(B) Repair

(C) Replication

(D) Transcription rate

75. Trp operon is :

(A) Inducible

(B) Repressible

(C) Constitutive

(D) Silent

76. Operon concept applies to :

(A) Eukaryotes

(B) Prokaryotes

(C) Both (A) and (B)

(D) None of the above

77. Epigenetic changes are :

(A) DNA sequence change

(B) Random

(C) Temporary

(D) Heritable without sequence change

78. Eukaryotic transcription factors bind :

(A) DNA

(B) RNA

(C) Protein

(D) Lipid

79. Silencers bind :

(A) Ligase

(B) Activators

(C) Repressors

(D) Polymerase

80. Antisense RNA binds to :

(A) DNA

(B) Protein

(C) mRNA

(D) Lipid

81. miRNA mainly causes :

(A) DNA mutation

(B) Translational repression

(C) Replication

(D) Splicing

82. siRNA mediates :

(A) Translation

(B) DNA repair

(C) RNA degradation

(D) Splicing

83. Histone acetylation causes :

(A) Tight chromatin

(B) Mutation

(C) DNA break

(D) Open chromatin

84. DNA methylation leads to :

(A) Activation

(B) Repression

(C) Translation

(D) Mutation

85. Enhancers function by :

(A) Binding repressors

(B) Degrading RNA

(C) Increasing transcription

(D) Blocking ribosomes

86. Operator region binds :

(A) RNA polymerase

(B) Ligase

(C) Activator

(D) Repressor

87. Trp operon attenuation depends on :

(A) Secondary structure in mRNA

(B) DNA structure

(C) RNA stability

(D) Protein folding

88. CAP binds to :

(A) Operator

(B) Promoter

(C) CAP site

(D) Terminator

89. cAMP levels increase when :

(A) Glucose is high

(B) Glucose is low

(C) Lactose is high

(D) Oxygen is low

90. Lac operon is negatively regulated by :

(A) CAP

(B) Activator

(C) Enhancer

(D) Repressor

91. UAA codon is recognized by :

(A) tRNA

(B) DNA polymerase

(C) rRNA

(D) RF1/RF2

92. Initiation complex requires :

(A) IFS + GTP

(B) Ligase

(C) Helicase

(D) Polymerase

93. Which site in the ribosome exits deacylated tRNA ?

(A) A site

(B) P site

(C) E site

(D) T site

94. Degeneracy reduces :

(A) Mutation effect

(B) Translation speed

(C) Protein length

(D) RNA stability

95. Protein folding is assisted by :

(A) Ligase

(B) Helicase

(C) Chaperones

(D) Polymerase

96. Glycosylation occurs in :

(A) Cytoplasm

(B) Ribosome

(C) Nucleus

(D) ER/Golgi

97. N-formyl methionine is found in :

(A) Eukaryotes

(B) Prokaryotes

(C) Both (A) and (B)

(D) None of the above

98. Kinetic proofreading in translation occurs at :

(A) A site

(B) P site

(C) E site

(D) Exit tunnel

99. Polysome formation indicates :

(A) Low translation

(B) High translation

(C) No translation

(D) RNA degradation

100. Charging of tRNA requires :

(A) ATP

(B) GTP

(C) NAD

(D) FAD

*(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।