Roll No. .....

Question Booklet Number

O. M. R. Serial No.

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

(New Syllabus Effective from 2023)

MOLECULAR BIOLOGY AND GENETICS

Paper Code								
L	0	2	0	8	0	1	T	(N)

Questions Booklet Series
B

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. Release factors recognize :

(A) Stop codons

(B) Start codons

(C) Anticodons

(D) Enhancers

2. Which antibiotic causes misreading of mRNA ?

(A) Streptomycin

(B) Chloramphenicol

(C) Puromycin

(D) Actinomycin D

3. Charging of tRNA requires :

(A) GTP

(B) NADPH

(C) FAD

(D) ATP

4. Aminoacyl-tRNA synthetase ensures fidelity by :

(A) Codon recognition

(B) Chemical proofreading in translation

(C) Ribosome binding

(D) mRNA cleavage

5. Which protein assists in folding newly synthesized polypeptides ?

(A) Ligase

(B) Chaperone

(C) Helicase

(D) Polymerase

6. Heat shock proteins are induced by :

(A) Cold stress

(B) UV radiation only

(C) DNA damage only

(D) High temperature stress

7. Signal peptide directs proteins to :

(A) Nucleus

(B) Ribosome

(C) Endoplasmic reticulum

(D) Golgi apparatus

8. SRP (Signal Recognition Particle) binds to :

(A) DNA

(B) mRNA

(C) Ribosomal RNA

(D) Signal peptide

9. Which modification occurs after translation ?

(A) Splicing

(B) Capping

(C) Phosphorylation

(D) Transcription

10. Which antibiotic mimics aminoacyl-tRNA ?

(A) Puromycin

(B) Tetracycline

(C) Streptomycin

(D) Erythromycin

11. In the lac operon, the inducer (allolactose) functions by :

(A) Activating RNA polymerase directly

(B) Binding to operator DNA

(C) Inactivating the repressor

(D) Enhancing CAP binding

12. Catabolite repression in the lac operon is mediated by :

(A) Lactose levels

(B) RNA polymerase σ factor

(C) Lac repressor

(D) cAMP-CAP complex

13. In high glucose conditions, lac operon transcription is low because :

(A) cAMP levels are low

(B) Repressor binds operator strongly

(C) CAP cannot bind DNA

(D) Both (B) and (C)

14. Which mutation would cause constitutive expression of the lac operon ?

(A) Mutation in CAP

(B) Mutation in promoter

(C) Mutation in operator preventing repressor binding

(D) Mutation in β- galactosidase

15. The trp operon is an example of :

(A) Inducible system

(B) Repressible system

(C) Constitutive system

(D) Enhancer system

16. Tryptophan acts as :

(A) Inducer

(B) Activator

(C) Enhancer

(D) Corepressor

17. Attenuation in the trp operon depends on :

(A) Ribosome stalling

(B) DNA methylation

(C) RNA polymerase pausing only

(D) CAP binding

18. Which region is crucial for attenuation control in trp operon ?

(A) Promoter

(B) Operator

(C) Leader sequence

(D) Terminator

19. In the arabinose operon, AraC protein acts as :

(A) Only repressor

(B) Only activator

(C) Both activator and repressor

(D) Neither activator nor repressor

20. When arabinose is absent, AraC protein :

(A) Activates transcription

(B) Forms a DNA loop

(C) Binds CAP

(D) Degrades mRNA

21. Lambda phage lysogeny is maintained by :

(A) Cro protein

(B) CAP protein

(C) AraC protein

(D) cI repressor

22. Switch from lysogenic to lytic cycle involves :

(A) Inactivation of cI repressor

(B) Activation of cI repressor

(C) Increase in CAP

(D) Decrease in RNA polymerase

23. Cro protein promotes :

(A) Lysogeny

(B) DNA replication only

(C) RNA degradation

(D) Lytic cycle

24. Enhancers differ from promoters because they :

(A) Are position-dependent

(B) Function at a distance

(C) Bind RNA polymerase directly

(D) Are only upstream

25. Eukaryotic repetitive DNA includes :

(A) Introns

(B) Exons

(C) Promoters

(D) Satellite DNA

26. Which modification is associated with gene activation ?

(A) DNA methylation

(B) Histone deacetylation

(C) Histone acetylation

(D) Chromatin condensation

27. DNA methylation generally leads to :

(A) Gene repression

(B) Gene activation

(C) Increased transcription

(D) RNA stability

28. 5′ caping of mRNA is important for :

(A) DNA replication

(B) Translation initiation

(C) Splicing only

(D) Termination

29. Polyadenylation affects :

(A) RNA stability and export

(B) DNA stability

(C) Transcription initiation

(D) Ribosome structure

30. Epigenetic regulation involves :

(A) DNA sequence change

(B) Histone modification

(C) RNA degradation

(D) Protein folding

31. Complete linkage occurs when :

(A) Genes are on different chromosomes

(B) Genes are very far apart on same chromosome

(C) No crossing over occurs between genes

(D) Recombination frequency is 50%

32. Recombination frequency of 1% corresponds to :

(A) 1 morgan

(B) 1 centimorgan

(C) 10 centimorgan

(D) 0.1 morgan

33. Double crossovers between two genes result in :

(A) Increased recombination frequency

(B) Underestimation of genetic distance

(C) Overestimation of distance

(D) No effect

34. Interference is defined as :

(A) Suppression of gene expression

(B) Increase in recombination

(C) Mutation rate

(D) Reduction in expected double crossovers

35. Coefficient of coincidence is :

(A) Observed Double crossover / Expected Double crossover

(B) Expected Double crossover / Observed Double crossover

(C) RF × 100

(D) RF/2

36. In a three-point test cross, the least frequent class represents :

(A) Parental type

(B) Single crossover

(C) Double crossover

(D) Mutation

37. Genes located close together on a chromosome are :

(A) Independent

(B) Mutated

(C) Epistatic

(D) Linked

38. Crossing over occurs during :

(A) Prophase I

(B) Metaphase I

(C) Anaphase I

(D) Telophase I

39. The structure where crossing over occurs is :

(A) Centromere

(B) Synaptonemal complex

(C) Kinetochore

(D) Chromatid

40. Which sex determination system is found in humans ?

(A) ZW-ZZ

(B) XO

(C) XY

(D) Haplodiploidy

41. In birds, females are :

(A) XX

(B) XY

(C) ZW

(D) ZZ

42. Haplodiploidy is seen in :

(A) Humans

(B) Birds

(C) Plants

(D) Honeybees

43. In Drosophila, sex in determined by :

(A) Presence of Y chromosome

(B) Ratio of X chromosomes to autosomes

(C) Environmental factors

(D) Gene mutation

44. Barr body represents :

(A) Active X chromosome

(B) Inactive X chromosome

(C) Y chromosome

(D) Autosome

45. X-inactivation in mammals is :

(A) Random

(B) Always paternal

(C) Always maternal

(D) Reversible

46. In Hardy-Weinberg equilibrium, allele frequencies remain constant in absence of :

(A) Mutation

(B) Migration

(C) Selection

(D) All of the above

47. Hardy-Weinberg equation is :

(A) $p + q = 1$

(B) $p^2 + 2pq + q^2 = 1$

(C) $p^2 + q^2 = 1$

(D) $pq = 1$

48. Heterozygote frequency in HW equilibrium is :

(A) p^2

(B) q^2

(C) $2pq$

(D) pq

49. Genetic drift is more significant in :

(A) Small populations

(B) Large populations

(C) Stable populations

(D) Random populations

50. Founder effect is a type of :

(A) Mutation

(B) Genetic drift

(C) Natural selection

(D) Migration

51. Which DNA polymerase is primarily responsible for chromosomal replication in *E. coli* ?

(A) DNA polymerase I

(B) DNA polymerase II

(C) DNA polymerase III

(D) DNA polymerase IV

52. The main function of DNA polymerase I in *E. coli* is :

(A) RNA primer removal and gap filling

(B) Leading strand synthesis

(C) Proofreading only

(D) DNA ligation

53. Which enzyme relieves supercoiling ahead of the replication fork in *E. coli* ?

(A) Helicase

(B) Primase

(C) DNA ligase

(D) DNA gyrase

54. The Okazaki fragments are synthesized on :

(A) Lagging strand

(B) Leading strand

(C) Both strands

(D) Template strand

55. Which protein prevents reannealing of single-stranded DNA during replication ?

(A) Helicase

(B) SSB protein

(C) Primase

(D) Ligase

56. In eukaryotes, which DNA polymerase is mainly responsible for lagging strand synthesis ?

(A) DNA polymerase α

(B) DNA polymerase β

(C) DNA polymerase δ

(D) DNA polymerase γ

57. Which enzyme synthesizes RNA primers during DNA replication ?

(A) Helicase

(B) DNA polymerase

(C) Ligase

(D) Primase

58. The replisome is best described as :

(A) A DNA repair complex

(B) A transcription unit

(C) A multi-protein DNA replication complex

(D) A ribosomal subunit

59. Which enzyme joins Okazaki fragments ?

(A) DNA polymerase III

(B) DNA ligase

(C) Topoisomerase I

(D) Primase

60. In *E. co*li, replication begins at a specific site known as :

(A) OriC

(B) TATA box

(C) Promoter

(D) Terminator

61. Which protein initiates replication by binding to OriC in *E. coli* ?

(A) DnaB

(B) DnaC

(C) SSB

(D) DnaA

62. Helicase unwinds DNA by :

(A) Breaking phosphodiester bonds

(B) Hydrolysing RNA primers

(C) Ligating DNA fragments

(D) Breaking hydrogen bonds

63. In eukaryotes, telomerase is required for :

(A) DNA repair

(B) Primer synthesis

(C) RNA transcription

(D) Replication of chromosome ends

64. Which enzyme removes RNA primers in eukaryotes ?

(A) DNA polymerase δ

(B) RNase H

(C) Ligase

(D) Helicase

65. DNA replication is described as semi-conservative because :

(A) DNA is copied in fragments

(B) One strand is conserved

(C) Each daughter molecule has one parental and one new strand

(D) Replication occurs in one direction

66. Mismatch repair primarily corrects :

(A) Replication errors

(B) Double-strand breaks

(C) UV-induced dimers

(D) Oxidative damage

67. DNA polymerases require which ion as a cofactor ?

(A) Na^+

(B) K^+

(C) Mg^{2+}

(D) Ca^{2+}

68. Which of the following is a DNA replication inhibitor ?

(A) Rifampicin

(B) Actinomycin D

(C) Ciprofloxacin

(D) Chloramphenicol

69. Mutation is defined as :

(A) DNA replication

(B) Permanent change in DNA sequence

(C) Protein synthesis

(D) RNA processing

70. Frameshift mutations are caused by :

(A) Deletion or insertion of nucleotides

(B) Base substitution

(C) DNA methylation

(D) Recombination

71. Which subunit of prokaryotic RNA polymerase is primarily responsible for promoter recognition ?

(A) α

(B) β

(C) β'

(D) σ

72. In *E. coli*, the – 10 promoter region is also known as :

(A) GC box

(B) Pribnow box

(C) TATA box

(D) CAAT box

73. Which RNA polymerase transcribes snRNA genes in eukaryotes ?

(A) RNA Pol I

(B) RNA Pol II

(C) RNA Pol III

(D) Both RNA Pol II and III

74. The CTD (C-terminal domain) of RNA polymerase II consists of repeats of :

(A) Tyr-Ser-Pro-Thr-Ser-Pro-Ser

(B) Ser-Tyr-Pro-Thr-Ser-Pro-Ser

(C) Tyr-Ser-Pro-Thr-Thr-Pro-Ser

(D) Ser-Tyr-Pro-Ser-Thr-Pro-Ser

75. Rho-dependent termination requires which of the following features ?

(A) GC-rich hairpin

(B) Rut site on RNA

(C) Poly-A tail

(D) Shine-Dalgarno sequence

76. Which factor is NOT required for initiation of transcription in eukaryotes ?

(A) TFIID

(B) TFIIH

(C) σ factor

(D) TFIIB

77. Enhancers differ from promoters in that they :

(A) Function only upstream

(B) Are orientation-dependent

(C) Can function at long distances

(D) Bind RNA polymerase directly

78. Which RNA type contains modified bases such as pseudouridine ?

(A) mRNA

(B) tRNA

(C) rRNA

(D) snRNA

79. Spliceosome-mediated splicing requires which snRNAS ?

(A) U1, U2, U4, U5, U6

(B) U3, U7, U8

(C) U1, U3, U5 only

(D) U2, U4 only

80. The Shine-Dalgarno sequence is involved in :

(A) Transcription initiation

(B) Translation initiation

(C) Termination

(D) Splicing

81. Which promoter element is recognized by TFIID ?

(A) CAAT box

(B) GC box

(C) TATA box

(D) BRE element

82. During elongation, RNA polymerase moves along DNA in which direction ?

(A) $3' \rightarrow 5'$

(B) $5' \rightarrow 3'$

(C) Both directions

(D) Random

83. Which RNA polymerase synthesizes 28S rRNA ?

(A) RNA Pol I

(B) RNA Pol II

(C) RNA Pol III

(D) RNA Pol IV

84. Reverse transcription involves synthesis of :

(A) RNA from DNA

(B) Protein from RNA

(C) RNA from protein

(D) DNA from RNA

85. Which factor phosphorylates RNA Pol II CTD ?

(A) TFIIH

(B) TFIID

(C) TFIIB

(D) TFIIE

86. Introns are removed by :

(A) RNA editing

(B) Splicing

(C) Polyadenylation

(D) Capping

87. The function of poly-A tail is :

(A) Initiate transcription

(B) Bind ribosome

(C) Enhance splicing

(D) Protect mRNA from degradation

88. In prokaryotes, transcription and translation are :

(A) Separate processes

(B) Coupled

(C) Independent

(D) Sequential

89. Alternative splicing results in :

(A) Increased gene number

(B) DNA replication

(C) Mutation

(D) Multiple proteins from one gene

90. Which RNA polymerase transcribes *t*-RNA genes ?

(A) RNA Pol I

(B) RNA Pol II

(C) RNA Pol III

(D) RNA Pol IV

91. Which feature of the genetic code ensures that a mutation in the third codon position often does not change the amino acid ?

(A) Non-overlapping nature
(B) Universality
(C) Polarity
(D) Degeneracy

92. The wobble position is located at :

(A) 1st base of codon
(B) 2nd base of codon
(C) 3rd base of codon
(D) Anticodon loop

93. In prokaryotes, the initiator tRNA carries :

(A) N-formylmethionine
(B) Methionine
(C) Cysteine
(D) Leucine

94. Which initiation factor prevents premature association of ribosomal subunits in prokaryotes ?

(A) IF-1
(B) IF-2
(C) IF-3
(D) EF-Tu

95. The Kozak sequence is important in :

(A) Transcription
(B) Prokaryotic translation
(C) Termination
(D) Eukaryotic translation initiation

96. Which antibiotic inhibits peptide bond formation ?

(A) Tetracycline
(B) Streptomycin
(C) Rifampicin
(D) Chloramphenicol

97. The peptidyl transferase activity resides in :

(A) 30S subunit
(B) 50S subunit rRNA
(C) Ribosomal proteins
(D) tRNA

98. Which elongation factor delivers aminoacyl-tRNA to ribosome in prokaryotes ?

(A) EF-Tu
(B) EF-G
(C) IF-2
(D) RF-1

99. Translocation during translation requires :

(A) ATP
(B) GTP
(C) cAMP
(D) NADH

100. Which of the following is a stop codon ?

(A) AUG
(B) UGG
(C) UAA
(D) UGU

(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।