

Roll No. ....

Question Booklet Number

O. M. R. Serial No.

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Question Booklet Number
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**M. Sc. (Microbiology) (Second Semester)**  
**EXAMINATION, 2025-26**  
**(New Syllabus Effective from 2023)**  
**FUNDAMENTALS OF MOLECULAR BIOLOGY**

Paper Code								
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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. What are the non-coding sequences of a gene that are removed during RNA splicing called ?
  - (A) Exons
  - (B) Promoters
  - (C) Introns
  - (D) Enhancers
2. The enzyme Poly-A Polymerase is responsible for adding a tail of adenine nucleotides to which part of the mRNA ?
  - (A) The 5' UTR
  - (B) The 3' end
  - (C) The promoter region
  - (D) The intron-exon junction
3. In eukaryotes, transcription occurs in the ..... while translation occurs in the .....
  - (A) Cytoplasm; Nucleus
  - (B) Nucleus; Cytoplasm
  - (C) Nucleus; Nucleus
  - (D) Mitochondria; Nucleus
4. Which complex is responsible for removing introns from a primary transcript ?
  - (A) Ribosome
  - (B) Spliceosome
  - (C) Nucleosome
  - (D) Replisome
5. The 'Poly-A tail' is added to which end of the mRNA ?
  - (A) 5' end
  - (B) 3' end
  - (C) Both ends
  - (D) Middle of the sequence
6. Splicing is the process where :
  - (A) Exons are removed and introns are joined)
  - (B) Introns are removed and exons are joined)
  - (C) The DNA double helix is unwound.
  - (D) Amino acids are assembled into proteins.

7. Which RNA Polymerase is responsible for the synthesis of tRNA ?
- (A) RNA Polymerase I
  - (B) RNA Polymerase II
  - (C) RNA Polymerase III
  - (D) Primase
8. What is the role of General Transcription Factors (GTFs) ?
- (A) They catalyze the formation of peptide bonds.
  - (B) They help RNA Polymerase bind to the promoter.
  - (C) They degrade introns after splicing.
  - (D) They transport mRNA to the cytoplasm.
9. The 5' cap added to eukaryotic mRNA consists of :
- (A) Poly-A tail
  - (B) 7-methylguanosine
  - (C) Adenine nucleotides
  - (D) Modified uracil
10. Which of the following is NOT a step in the processing of eukaryotic pre-mRNA ?
- (A) 5' Capping
  - (B) 3' Polyadenylation
  - (C) Intron Splicing
  - (D) Reverse Transcription
11. The TATA box is a common promoter element found in eukaryotes. Where is it typically located ?
- (A) + 10 region
  - (B) - 10 region
  - (C) - 25 to - 35 region
  - (D) + 35 region
12. Which enzyme is responsible for synthesizing mRNA in eukaryotes ?
- (A) RNA Polymerase I
  - (B) RNA Polymerase II
  - (C) RNA Polymerase III
  - (D) DNA Polymerase alpha

13. Which Sigma factor  $\sigma$  is the “housekeeping” factor in *E. coli*, responsible for the transcription of most genes during exponential growth ?
- (A)  $\sigma^{32}$
  - (B)  $\sigma^{54}$
  - (C)  $\sigma^{70}$
  - (D)  $\sigma^{28}$
14. The ‘Open Complex’ during transcription initiation is characterized by :
- (A) The initial binding of the Holoenzyme to the DNA.
  - (B) The localized melting (unwinding) of approximately 14 bp of DNA around the start site.
  - (C) The formation of the first phosphodiester bond)
  - (D) The binding of the Rho factor to the polymerase.
15. Rifampicin is an antibiotic that inhibits prokaryotic transcription by :
- (A) Intercalating between DNA base pairs.
  - (B) Binding to the  $\beta$  subunit and blocking the exit of the nascent RNA chain.
  - (C) Mimicking the structure of an incoming NTP.
  - (D) Preventing the binding of the Sigma factor to the core enzyme.
16. Which subunit of the prokaryotic RNA Polymerase is responsible for binding to the ‘UP element’ found in highly expressed genes like rRNAs ?
- (A) Sigma ( $\sigma$ )
  - (B) Beta ( $\beta$ )
  - (C) Alpha ( $\alpha$ ) C-terminal domain
  - (D) Omega ( $\omega$ )

17. The Rho protein, involved in Rho-dependent termination, possesses which enzymatic activity to 'catch up' with the RNA Polymerase ?
- (A) 5' – 3' Exonuclease  
 (B) ATP-dependent Helicase  
 (C) DNA Ligase  
 (D) Peptidyl Transferase
18. In 'Rho-independent' (Intrinsic) termination, the termination signal on the newly synthesized RNA consists of :
- (A) A poly-A tail followed by a G-C rich region.  
 (B) A stable G-C rich hairpin loop followed by a string of Uracil (U) residues.  
 (C) A C-rich sequence known as the "Rut" site.  
 (D) A binding site for the NusA protein.
19. 'Abortive Initiation' refers to a process where RNA Polymerase :
- (A) Synthesizes and releases short RNA transcripts (2-10 nt) before clearing the promoter.  
 (B) Terminates transcription prematurely due to DNA damage.  
 (C) Fails to bind to the – 35 consensus sequence.  
 (D) Degrades the DNA template during unwinding.
20. During the transition from 'Initiation' to 'Elongation,' RNA Polymerase undergoes a conformational change and releases which component ?
- (A) The  $\beta'$  subunit  
 (B) The nascent RNA strand  
 (C) The Sigma ( $\sigma$ ) factor  
 (D) The Rho protein

21. In prokaryotic promoters, the 'Pribnow Box' is a conserved hexanucleotide sequence located at which position relative to the transcription start site (+1) ?
- (A) - 35 region
  - (B) - 10 region
  - (C) + 10 region
  - (D) - 75 region
22. The 'Core Enzyme' of *E. coli* RNA Polymerase lacks which specific subunit required for the initiation of transcription at specific promoter sites ?
- (A) Alpha ( $\alpha$ )
  - (B) Beta ( $\beta$ )
  - (C) Sigma ( $\sigma$ )
  - (D) Omega ( $\omega$ )
23. What is the function of Single-Strand Binding (SSB) proteins ?
- (A) To catalyze the formation of phosphodiester bonds
  - (B) To prevent the separated DNA strands from re-annealing
  - (C) To identify mismatched base pairs
  - (D) To terminate replication at the *ter* site
24. Which eukaryotic DNA polymerase is primarily responsible for the highly processive synthesis of the leading strand ?
- (A) DNA Polymerase  $\alpha$
  - (B) DNA Polymerase  $\beta$
  - (C) DNA Polymerase  $\delta$
  - (D) DNA Polymerase  $\epsilon$

25. The DnaA protein in *E. coli* initiates replication by binding to specific sequences within :
- (A) *ter* sites
  - (B) *oriC* (Origin of Chromosomal Replication)
  - (C) Promoter regions
  - (D) Centromeres
26. 'Okazaki Fragments' are synthesized on the lagging strand. In eukaryotes, the removal of the RNA-DNA primer "flap" is primarily performed by :
- (A) DNA Polymerase I
  - (B) RNase H and FEN1 (Flap Endonuclease 1)
  - (C) DNA Ligase I
  - (D) Topoisomerase III
27. During eukaryotic replication, 'Polymerase Switching' occurs when :
- (A) Pol  $\alpha$  is replaced by Pol  $\epsilon$  or Pol  $\delta$  .
  - (B) Pol III is replaced by Pol I.
  - (C) RNA Polymerase is replaced by DNA Polymerase.
  - (D) Primase is replaced by Helicase.
28. Which topoisomerase is responsible for relieving the positive supercoiling (torsional stress) ahead of the replication fork by making double-strand breaks ?
- (A) Topoisomerase I
  - (B) Topoisomerase II (DNA Gyrase in bacteria)
  - (C) DNA Helicase
  - (D) SSB proteins
29. The 'Licensing Factor' required for the initiation of eukaryotic DNA replication, which ensures DNA is replicated only once per cell cycle, is :
- (A) PCNA
  - (B) MCM (Minichromosome Maintenance) complex
  - (C) ORC (Origin Recognition Complex)
  - (D) Cdc6 and Cdt1

30. In eukaryotes, the “End Replication Problem” is solved by Telomerase. Telomerase is a unique enzyme categorized as a :
- (A) DNA-dependent DNA polymerase
  - (B) RNA-dependent DNA polymerase (Reverse Transcriptase)
  - (C) DNA-dependent RNA polymerase
  - (D) RNA-dependent RNA polymerase
31. What is the role of the ‘Clamp Loader’ ( $\gamma$  complex) in the DNA Polymerase III holoenzyme ?
- (A) To synthesize the RNA primer
  - (B) To unzip the double helix
  - (C) To load the  $\beta$ -sliding clamp onto the DNA template
  - (D) To provide 3'–5' proofreading activity
32. During *E. coli* DNA replication, which enzyme is responsible for removing the RNA primer and replacing it with DNA through its 5'–3' exonuclease activity ?
- (A) DNA Polymerase III
  - (B) DNA Polymerase I
  - (C) DNA Ligase
  - (D) Primase (DnaG)
33. Ku70 and Ku80 heterodimers are essential components of which repair machinery ?
- (A) Mismatch Repair
  - (B) Base Excision Repair
  - (C) Non-Homologous End Joining
  - (D) Nucleotide Excision Repair
34. In the SOS Response in *E. coli*, which protein acts as the primary ‘sensor’ by binding to single-stranded DNA and stimulating the autocatalytic cleavage of the LexA repressor ?
- (A) DNA Pol III
  - (B) RecA
  - (C) SuIA
  - (D) UvrD

35. What is the fundamental difference between Homologous Recombination (HR) and Non-Homologous End Joining (NHEJ) for repairing Double-Strand Breaks (DSBs) ?
- (A) NHEJ is error-free, while HR is highly mutagenic).
- (B) HR requires a sister chromatid as a template; NHEJ does not.
- (C) HR occurs only in the G1 phase of the cell cycle.
- (D) NHEJ uses DNA Polymerase for long-patch synthesis.
36. The 'Mismatch Repair' (MMR) system in *E. coli* distinguishes the parent strand from the newly synthesized daughter strand based on :
- (A) Phosphorylation status
- (B) Acetylation of histones
- (C) Hemimethylation at GATC sequences
- (D) Thiolation of uracil
37. During Base Excision Repair (BER), the enzyme that cleaves the phosphodiester backbone specifically at an abasic (AP) site is :
- (A) DNA Pol I
- (B) DNA Ligase III
- (C) AP Endonuclease
- (D) Uracil-DNA Glycosylase
38. In Bacterial Nucleotide Excision Repair (NER), which protein complex is responsible for identifying the lesion and melting the DNA helix ?
- (A) UvrA and UvrB
- (B) UvrC and UvrD
- (C) Muts and MutL
- (D) RecA and RecBCD
39. Which enzyme is responsible for the direct reversal of DNA damage by removing methyl groups from O6-methylguanine in a 'suicide' reaction ?
- (A) DNA Glycosylase
- (B) O6-methylguanine-DNA methyltransferase (MGMT)
- (C) Photolyase
- (D) AP Endonucleas

40. Which type of DNA damage involves the insertion of flat, hydrophobic molecules between the stacked base pairs, causing frameshift mutations ?
- (A) Alkylation
  - (B) Oxidation
  - (C) Intercalation
  - (D) Depurination
41. Deamination of Adenine converts it into Hypoxanthine, which subsequently forms hydrogen bonds with :
- (A) Thymine
  - (B) Cytosine
  - (C) Guanine
  - (D) Adenine
42. 5-Bromouracil (5-BU) acts as a mutagen by substituting for thymine. In its rare enol-tautomer form, it mistakenly pairs with :
- (A) Adenine
  - (B) Cytosine
  - (C) Guanine
  - (D) Uracil
43. Which base is generated specifically by the deamination of 5-methyl cytosine, often leading to 'hotspots' for transition mutations ?
- (A) Uracil
  - (B) Thymine
  - (C) Adenine
  - (D) Hypoxanthine
44. Hydrolytic damage leading to the spontaneous loss of the N-glycosyl linkage results in the creation of :
- (A) Thymine dimers
  - (B) Abasic (AP) sites
  - (C) Phosphodiester nicks
  - (D) DNA-protein crosslinks
45. The formation of a 'Cyclobutane ring' between adjacent pyrimidines is the signature structural feature of damage caused by :
- (A) Ionizing radiation
  - (B) Ultraviolet (UV) light
  - (C) Intercalating agents
  - (D) Alkylating agents

46. Which specific carbon position of the Guanine residue is the most vulnerable site for alkylation by potent laboratory mutagens like MNNG ?
- (A) C-2  
(B) C-4  
(C) C-6  
(D) N-7
47. The spontaneous deamination of Cytosine under physiological conditions results in the formation of which 'unnatural' DNA base ?
- (A) Hypoxanthine  
(B) Xanthine  
(C) Uracil  
(D) 5-Methylcytosine
48. Which DNA form has the smallest diameter and the highest number of base pairs per turn ?
- (A) A-DNA  
(B) B-DNA  
(C) Z-DNA  
(D) C-DNA
49. The temperature at which half of the DNA molecules in a sample are denatured is known as the melting temperature ( $T_m$ ). Which of the following factors increases the ( $T_m$ ) of a DNA molecule ?
- (A) High Adenine-Thymine (A-T) content  
(B) Low salt concentration in the buffer  
(C) High Guanine-Cytosine (G-C) content  
(D) Presence of urea or formamide
50. Z-DNA is a unique left-handed helix. Which specific sequence and sugar pucker combination is characteristic of its 'zigzag' backbone ?
- (A) Alternating (AT)  $n$  sequences; all C2'-endo puckers.  
(B) Alternating (GC)  $n$  sequences; alternating C2'-endo and C3'-endo puckers.  
(C) Homopurine stretches; all C3'-endo puckers.  
(D) Alternating (GC)  $n$  sequences; all syn-conformation bases.

51. Mitochondrial and chloroplast proteins synthesized in the cytosol are kept in an unfolded state by which proteins before they are imported ?
- (A) Chaperones (e.g., Hsp70)
- (B) Snurps (snRNPs)
- (C) Proteasomes
- (D) Ubiquitin ligases
52. Proteins destined for the nucleus contain a specific sequence of basic amino acids known as the :
- (A) Nuclear Export Signal (NES)
- (B) Nuclear Localization Signal (NLS)
- (C) TATA box
- (D) Leader sequence
53. The process of “bulk” transport where a cell secretes large amounts of proteins into the extracellular space is called :
- (A) Endocytosis
- (B) Exocytosis
- (C) Autophagy
- (D) Transcytosis
54. Which modification occurs in the Golgi apparatus to target enzymes specifically to the lysosome ?
- (A) Addition of a Poly-A tail
- (B) Attachment of Mannose-6-phosphate (M6P)
- (C) Palmitoylation
- (D) Myristoylation

55. The KDEL sequence (Lys-Asp-Glu-Leu) at the C-terminus of a protein serves as a :
- (A) Signal for secretion out of the cell
  - (B) Degradation signal for the proteasome
  - (C) Retrieval signal to return the protein to the ER
  - (D) Nuclear localization signal
56. Proteins moving from the Endoplasmic Reticulum to the Golgi apparatus are packaged into vesicles coated with :
- (A) COPI
  - (B) COPII
  - (C) Clathrin
  - (D) Dynamin
57. Retrograde transport (movement of proteins from the Golgi back to the ER) is mediated by which type of coated vesicle ?
- (A) COPI
  - (B) COPII
  - (C) Clathrin
  - (D) Caveolin
58. The 'Signal Hypothesis' describes how a specific sequence of amino acids directs a protein to the ER. This signal sequence is usually located at the :
- (A) C-terminus
  - (B) N-terminus
  - (C) Middle of the polypeptide
  - (D) 3' UTR of the mRNA

59. Proteins destined for secretion or the plasma membrane are typically synthesized on :
- (A) Free ribosomes in the cytoplasm
  - (B) Ribosomes attached to the Rough Endoplasmic Reticulum (RER)
  - (C) Smooth Endoplasmic Reticulum (SER)
  - (D) The Golgi apparatus
60. Which translation inhibitor acts as a structural analog of aminoacyl-tRNA, causing premature chain termination in both prokaryotes and eukaryotes ?
- (A) Puromycin
  - (B) Streptomycin
  - (C) Tetracycline
  - (D) Erythromycin
61. Which inhibitor is specific to eukaryotic translation and blocks the peptidyl transferase activity of the 60S subunit ?
- (A) Chloramphenicol
  - (B) Cycloheximide
  - (C) Erythromycin
  - (D) Tetracycline
62. Which toxin inactivates the eukaryotic elongation factor eEF2 through ADP-ribosylation, halting translocation ?
- (A) Ricin
  - (B) Diphtheria toxin
  - (C) Alpha-amanitin
  - (D) Tetracycline
63. Which antibiotic prevents the binding of aminoacyl-tRNA to the A-site of the prokaryotic 30S subunit ?
- (A) Tetracycline
  - (B) Streptomycin
  - (C) Rifampicin
  - (D) Puromycin

64. Which inhibitor blocks the peptidyl transferase center of the 50S ribosomal subunit in bacteria ?
- (A) Tetracycline
  - (B) Puromycin
  - (C) Chloramphenicol
  - (D) Cycloheximide
65. Which antibiotic inhibits translation in prokaryotes by binding to the 30S subunit and causing the misreading of mRNA ?
- (A) Penicillin
  - (B) Streptomycin
  - (C) Chloramphenicol
  - (D) Erythromycin
66. In eukaryotes, translation occurs primarily in the :
- (A) Nucleus
  - (B) Nucleolus
  - (C) Cytoplasm
  - (D) Lysosome
67. Eukaryotic release factors (eRFs) recognize how many stop codons ?
- (A) Only one
  - (B) Two (UAA and UAG)
  - (C) All three (UAA, UAG, UGA)
  - (D) None of the above
68. Which of these serves as the catalytic component (ribozyme) for peptide bond formation in the eukaryotic 60S subunit ?
- (A) 18S rRNA
  - (B) 5S rRNA
  - (C) 28S rRNA
  - (D) 16S rRNA
69. Translocation of the eukaryotic ribosome along the mRNA is catalyzed by :
- (A) eEF1A
  - (B) eEF2
  - (C) eIF3
  - (D) Peptidyl transferase

70. The Poly-A tail of mRNA enhances translation by interacting with the 5' cap through which protein ?
- (A) PABP (Poly-A Binding Protein)
  - (B) Rho factor
  - (C) Sigma factor
  - (D) Spliceosome
71. Which eukaryotic elongation factor is responsible for bringing the aminoacyl-tRNA to the A-site ?
- (A) eEF1A
  - (B) eEF2
  - (C) eIF2
  - (D) eEF1B
72. Unlike prokaryotes, eukaryotic translation typically begins with which amino acid ?
- (A) N-formylmethionine
  - (B) Valine
  - (C) Leucine
  - (D) Methionine
73. The small ribosomal subunit in eukaryotes is :
- (A) 30S
  - (B) 40S
  - (C) 50S
  - (D) 60S
74. Which initiation factor is responsible for binding the 5' cap of eukaryotic mRNA to the small ribosomal subunit ?
- (A) eIF2
  - (B) eIF3
  - (C) eIF4E
  - (D) eIF5
75. What is the role of aminoacyl-tRNA synthetase ?
- (A) It joins the 30S and 50S subunits.
  - (B) It attaches the correct amino acid to its corresponding tRNA.
  - (C) It moves the ribosome to the next codon.
  - (D) It removes introns from the tRNA.

76. Which release factor (RF) recognizes the UAA and UAG stop codons in *E. coli* ?
- (A) RF-1
  - (B) RF-2
  - (C) RF-3
  - (D) RF-4
77. To which site on the ribosome does the initiator tRNA (fMet-tRNA) directly bind during initiation ?
- (A) A-site
  - (B) P-site
  - (C) E-site
  - (D) Z-site
78. Translocation of the ribosome along the mRNA requires energy from GTP hydrolysis and which factor ?
- (A) EF-Tu
  - (B) EF-Ts
  - (C) EF-G
  - (D) IF-1
79. The formation of a peptide bond between two amino acids is catalyzed by :
- (A) Aminoacyl-tRNA synthetase
  - (B) Peptidyl transferase (23S rRNA)
  - (C) RNA Polymerase
  - (D) EF-G
80. During elongation, which elongation factor brings the charged aminoacyl-tRNA to the A-site of the ribosome ?
- (A) EF-G
  - (B) EF-Tu
  - (C) EF-Ts
  - (D) IF-2
81. Which initiation factor (IF) prevents the 30S and 50S subunits from associating prematurely ?
- (A) IF-1
  - (B) IF-2
  - (C) IF-3
  - (D) EF-Tu

82. The Shine-Dalgarno sequence is typically located :
- (A) 3' to the stop codon.
  - (B) Within the coding region of the gene.
  - (C) 8-13 nucleotides upstream of the start codon.
  - (D) At the very 5' end of the mRNA cap.
83. The first amino acid incorporated into a prokaryotic polypeptide chain is :
- (A) Methionine
  - (B) N-formylmethionine (fMet)
  - (C) Glycine
  - (D) Alanine
84. Which component of the prokaryotic ribosome is responsible for identifying the Shine-Dalgarno sequence on mRNA ?
- (A) 23S rRNA
  - (B) 16S rRNA
  - (C) 5S rRNA
  - (D) 50S subunit
85. The binding of a corepressor to an aporepressor results in :
- (A) The detachment of the repressor from the operator.
  - (B) A conformational change that allows the repressor to bind to the operator.
  - (C) The degradation of the promoter sequence.
  - (D) The recruitment of the CAP protein.
86. A 'Polycistronic' mRNA is a characteristic of prokaryotic gene regulation where :
- (A) One mRNA molecule codes for multiple different proteins.
  - (B) Multiple mRNA molecules code for one protein.
  - (C) mRNA is heavily spliced before translation.
  - (D) mRNA contains only one start and one stop codon.

87. In the *trp* operon attenuation mechanism, which hairpin structure acts as the transcriptional terminator ?
- (A) 1-2 hairpin
  - (B) 2-3 hairpin
  - (C) 3-4 hairpin
  - (D) 1-4 hairpin
88. During 'Catabolite Repression,' the presence of glucose leads to :
- (A) High levels of cAMP and high transcription of the lac operon.
  - (B) Low levels of cAMP and low transcription of the lac operon.
  - (C) High levels of allolactose and high transcription.
  - (D) Binding of the repressor to the CAP site.
89. What is the function of the *lacY* gene within the lac operon ?
- (A) It encodes  $\beta$ -galactosidase to break down lactose.
  - (B) It encodes lactose permease to transport lactose into the cell.
  - (C) It encodes transacetylase to detoxify thiogalactosides.
  - (D) It encodes the repressor protein.
90. In the absence of tryptophan, what happens to the *trp* repressor protein ?
- (A) It binds to the operator to block transcription.
  - (B) It binds to the promoter to enhance transcription.
  - (C) It remains inactive and cannot bind to the operator.
  - (D) It is degraded by proteases.

91. Which of the following describes a 'constitutive' gene in prokaryotes ?
- (A) A gene that is only expressed during stress.
  - (B) A gene that is expressed continuously at a relatively constant level.
  - (C) A gene that is regulated by an inducer.
  - (D) A gene that is always silenced by a repressor.
92. The *trp* operon is regulated by a process called attenuation. This mechanism relies on the formation of specific secondary structures in which molecule ?
- (A) DNA template
  - (B) Repressor protein
  - (C) Leader mRNA
  - (D) Ribosomal RNA
93. In the *lac* operon, which molecule binds to the Catabolite Activator Protein (CAP) to assist RNA polymerase binding when glucose levels are low ?
- (A) ATP
  - (B) cAMP
  - (C) Allolactose
  - (D) Tryptophan
94. The Trp operon is considered a repressible operon because :
- (A) It is always turned off unless lactose is present.
  - (B) It is turned off when the end-product (tryptophan) is abundant.
  - (C) It only functions in eukaryotic cells.
  - (D) It requires a sigma factor to be silenced.

95. Histone acetylation generally leads to :
- (A) Chromatin condensation and gene silencing
  - (B) Removals of the TATA box
  - (C) Chromatin loosening and increased transcription
  - (D) Permanent DNA mutations
96. MicroRNAs (miRNAs) regulate gene expression post-transcriptionally by :
- (A) Adding a 5' cap to mRNA.
  - (B) Binding to complementary mRNA sequences to inhibit translation or cause degradation.
  - (C) Moving mRNA from the cytoplasm back into the nucleus.
  - (D) Acetylating histone proteins.
97. What is the primary effect of DNA methylation on gene expression ?
- (A) It increases transcription
  - (B) It triggers RNA splicing
  - (C) It usually silences gene expression
  - (D) It speeds up translation
98. Which molecule acts as an inducer in the Lac operon, causing the repressor to detach from the DNA ?
- (A) Glucose
  - (B) Tryptophan
  - (C) Allolactose
  - (D) cAMP
99. In the Lac operon, the repressor protein binds to which specific DNA site to block transcription ?
- (A) Promoter
  - (B) Operator
  - (C) Enhancer
  - (D) Structural gene
100. Which process allows a single gene to code for multiple different proteins by including or excluding specific exons ?
- (A) RNA interference
  - (B) Alternative splicing
  - (C) Reverse transcription
  - (D) DNA methylation

***(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 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।