Roll No. .....

Question Booklet Number

O. M. R. Serial No.

M. Sc. (Microbiology) (Second Semester)

EXAMINATION, July, 2022

FUNDAMENTALS OF MOLECULAR BIOLOGY

Paper Code				
MIC	2	0	0	2

Questions Booklet Series
A

Time : 1:30 Hours] [*Maximum Marks : 100*

Instructions to the Examinee :

1. Do not open the booklet unless you are asked to do so.
2. The booklet contains 60 questions. Examinee is required to answer any 50 questions in the OMR Answer-Sheet provided and not in the question booklet. If more than 50 questions are attempted by student, then the first attempted 50 questions will be considered for evaluation. 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 60 प्रश्न हैं। परीक्षार्थी को किन्हीं 50 प्रश्नों को केवल दी गई OMR आन्सर-शीट पर ही हल करना है, प्रश्न-पुस्तिका पर नहीं। यदि छात्र द्वारा 50 से अधिक प्रश्नों को हल किया जाता है तो प्रारम्भिक हल किये हुए 50 उत्तरों को ही मूल्यांकन हेतु सम्मिलित किया जाएगा। 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. Blender experiment proved that DNA is the genetic material performed by :

(A) Griffith experiment

(B) The Hershey-Chase experiments

(C) Avery, McCarthy experiment and MacLeod

(D) Messelson-Stahl experiment

2. Who prove that DNA replication is semi-conservative ?

(A) Griffith experiment

(B) The Hershey-Chase experiment

(C) Avery, McCarthy and MacLeod

(D) Messelson-Stahl experiment

3. First DNA polymerase is isolated by :

(A) Arthur Kornberg

(B) Watson-Crick

(C) Griffith

(D) Avery and McCarthy

4. 5′-3′ exonuclease activity is present in :

(A) DNA polymerase I

(B) DNA polymerase II

(C) DNA polymerase III

(D) DNA polymerase IV

5. Which RNA polymerase in the production of mRNA in eukaryotes ?

(A) RNA polymerase I

(B) RNA polymerase II

(C) RNA polymerase III

(D) RNA polymerase IV

6. The bacterial system has _____ RNA polymerases.

(A) 1

(B) 2

(C) 3

(D) 4

7. Which of the following has no contribution to the stability of tRNA ?

(A) Hydrogen bonding

(B) Hydrophobic interactions

(C) Base and sugar-phosphate backbone interaction

(D) Base pairing

8. Who recognizes *oriC* sequences for initiation of replication ?

(A) DnaA

(B) DanB

(C) DnaC

(D) DnaG

9. Function of DanB is :

(A) helicase

(B) recognizes *oriC*

(C) topoisomerase

(D) ssb protein

10. Which enzyme seal nicks between adjacent nucleotides by employing an enzyme-AMP intermediate ?

(A) Topoisomerase

(B) Primase

(C) DNA ligase

(D) None of the above

11. Two replication fork meets at terminator recognizing sequences, called as a/an :

(A) *Ter*

(B) *Tus*

(C) *Ori c*

(D) *Ori V*

12. Which of the following is RNA made up of ?

(A) Adenine, Cytosine, Guanine and Uracil

(B) Adenine, Guanine, Cytosine and Thymine

(C) Adenine, Guanine, Uracil and Thymine

(D) Adenine, Uracil, Cytosine and Thymine

13. Which of the following functions of DNA is necessary for the purpose of evolution ?

(A) Mutation

(B) Replication

(C) Translation

(D) Transcription

14. Which of the following is not a component of the nucleic acid backbone ?

(A) Nucleotide

(B) Phosphate group

(C) Pentose sugar

(D) Phosphodiesterase bond

15. Which of the following does not take part in gene expression ?

(A) Transcription

(B) RNA processing

(C) Replication

(D) Translation

16. Which of the following is not a characteristic of nucleotide bases ?

(A) Planar

(B) Heterocyclic

(C) Aliphatic

(D) Ubiquitous

17. Pick the correct pair with respect to primers used in DNA replication :

(A) RNA primer–for prokaryotes only

(B) DNA primer–for eukaryotes only

(C) DNA primer–for both prokaryotes and eukaryotes

(D) RNA primer–for both prokaryotes and eukaryotes

18. Which of the following is correctly matched with its subsequent role ?

(A) Topoisomerase II–can remove both positive and negative supercoil in the DNA duplex

(B) Polymerase I–larger fragment responsible for exonuclease activity

(C) DnaA protein–responsible for "melting" of the DNA double helix during replication

(D) DnaB protein–attaches to the newly unwounded single strand of DNA to prevent folding of the strand

19. Replication fork is the junction between the two _____.

(A) Unreplicated DNA

(B) Newly synthesized DNA

(C) Newly separated DNA strands and newly synthesized DNA strands

(D) Newly separated DNA strands and the unreplicated DNA

20. Who was the first person to analyse the process of replication and on which organism ?

(A) Arthur Kornberg : *E. coli*

(B) John Cairns : *E. coli*

(C) Arthur Kornberg : *Bacillus subtilis*

(D) John Cairns : *Bacillus subtilis*

21. Which of the following is main enzyme used in prokaryotic replication ?

(A) DNA polymerase I

(B) DNA polymerase II

(C) DNA polymerase III

(D) DNA polymerase δ

22. Which of the following is false about klenow fragment ?

(A) Polymerization activity

(B) $3' \rightarrow 5'$ exonuclease activity

(C) $5' \rightarrow 3'$ exonuclease activity

(D) $324 \rightarrow 928$ residue of polymerase I

23. Which of the following types of DNA polymerase does not take part in DNA repair ?

(A) DNA polymerase I

(B) DNA polymerase II

(C) DNA polymerase III

(D) DNA polymerase IV

24. When we compare the structure of DNA polymerase to the structure of a body part, it resembles to _____.

(A) Right hand

(B) Left hand

(C) Right foot

(D) Left foot

25. Which of the following is not true about nucleotides ?

(A) Monomeric units

(B) Ubiquitous substances

(C) Energy rich molecules

(D) Non-enzymatic molecules

26. How many polymerases are present in a replication fork in eukaryotes ?

(A) 2

(B) 3

(C) 4

(D) 5

27. Length of Okazaki fragments in eukaryotes ranges between _____ nucleotides.

(A) 100—400

(B) 400—800

(C) 800—1200

(D) 1200—1600

28. How is the genetic material expressed ?

(A) By replication and transcription

(B) By transcription and translation

(C) By translation and modification

(D) By mutation and transposition

29. Which of the following RNA polymerases is responsible for the production of 5S rRNA ?

(A) RNA polymerase I

(B) RNA polymerase II

(C) RNA polymerase III

(D) RNA polymerase IV

30. Which RNA polymerase deals with the production of mRNA ?

(A) RNA polymerase I

(B) RNA polymerase II

(C) RNA polymerase III

(D) RNA polymerase IV

31. The *E. coli* DNA polymerase adds _____ nucleotides per second.

(A) 200

(B) 300

(C) 500

(D) 1000

32. The RNA polymerase holoenzyme has the structural formula of _____ in prokaryotes.

(A) $\alpha 2\beta\beta'\omega\sigma$

(B) $\alpha\beta 2\beta'\omega\sigma$

(C) $\alpha 2\beta\beta'\omega$

(D) $\alpha 2\beta\beta'\sigma$

33. The transcription process carried out by the RNA polymerase is very accurate but less accurate than replication.

(A) True

(B) False

34. The Pribnow box is present on the coding strand of the DNA template.

(A) True

(B) False

35. The complex formed by the polymerase and the promoter DNA is known as the _____.

(A) λ complex

(B) γ complex

(C) Open complex

(D) Closed complex

36. Which of the following is not a feature of the genetic code ?

(A) Triplet

(B) Degenerate

(C) Non-overlapping

(D) Ambiguous

37. The distribution of codon is made in such a way to minimize mutation effect.

(A) True

(B) False

38. Which of the following is not a part of the RNA polymerase core enzyme ?

(A) α

(B) β

(C) ω

(D) σ

39. Protein kinases transfer phosphate groups to the side chains of which of the following ?

(A) Serine

(B) Valine

(C) Glutamate

(D) Lysine

40. mRNA of which of the following organisms does not undergo processing ?

(A) Human

(B) Yeast

(C) Bacteria

(D) Fungi

41. Which of the following is not a type of RNA processing ?

(A) Polyadenylation at the 3′ end

(B) Capping of 5′ end

(C) Removal of exons

(D) Splicing

42. The first RNA processing event is _____.

(A) Capping

(B) Tailing

(C) Splicing

(D) Editing

43. About how many "A" are added to the nascent RNA in the 5′ end during Polyadenylation ?

(A) 100

(B) 200

(C) 300

(D) 0

44. Capping is done by the addition of _____.

(A) Methylated A

(B) Methylated T

(C) Methylated G

(D) Methylated C

45. Which of the following about the enhancers is false ?

(A) They function in any orientation.

(B) They function as promoter sequences.

(C) They work as both cis and trans-acting sequences.

(D) They are tissue specific.

46. In the case of transcription regulation what is the function of enhancer molecules ?

(A) Helps initiate transcription

(B) Transcription elongation

(C) Stimulates the rate of transcription

(D) mRNA stability enhancement

47. Acetylation of histone increases transcription of gene due to :

(A) Increase in the DNA-histone interaction.

(B) It loosens the DNA-histone complex thus making it accessible to RNA polymerase.

(C) It induces DNA blending which is recognized by RNA polymerase.

(D) The acetyl groups are recognizable by RNA polymerase.

48. The most commonly observed modification in the histone includes _____.

(A) Acetylation of lysine and phosphorylation of serine

(B) Acetylation of lysine and phosphorylation of threonine

(C) Acetylation of arginine and phosphorylation of threonine

(D) Acetylation of arginine and phosphorylation of serine

49. Which of the following about the differences between the prokaryotic and eukaryotic genes is true ?

(A) Prokaryotic genes are large, polycistronic and contain enhancers.

(B) Eukaryotic genes are large, polycistronic and contain enhancers.

(C) Prokaryotic genes are large, monocistronic and contain introns.

(D) Eukaryotic genes are large, monocistronic and contain introns.

50. How many major components are used for the process of translation ?

(A) 1

(B) 2

(C) 3

(D) 4

51. Which of the following is not a property of open reading frame ?

(A) Contiguous

(B) Non-overlapping

(C) Encodes a single protein

(D) Starts and ends at either end of the mRNA

52. The start codon has a vital role to play in incorporating the specific amino acids in the peptide chains.

(A) True

(B) False

53. Shine-Dalgarno sequence is also known as the _____.

(A) ORF

(B) RBS

(C) Stop codon

(D) Start codon

54. Which component of the rRNA binds to the mRNA ?

(A) 16S

(B) 5S

(C) 28S

(D) 23S

55. Which of the following about the enhancer sequence is incorrect ?

(A) They are required for transcriptional regulation of some genes.

(B) They can work in both directions.

(C) They can work when present in any position of the DNA.

(D) They are not responsible for specificity of tissues.

56. The large ribosomal subunit in prokaryotes has the sedimentation velocity of _____.

(A) 30S

(B) 40S

(C) 50S

(D) 60S

57. Ribosome has two subunits with 4 rRNA molecules. Which of these four rRNAs is found in the decoding center of the ribosome ?

(A) 5S

(B) 23S

(C) 28S

(D) 16S

58. The 3′ end of tRNA is _____.

(A) 3′ CCA 5′

(B) 3′ ACC 5′

(C) 3′ CCG 5′

(D) 3′ GCC 5′

59. With respect to tRNA which of the following is not its characteristic ?

(A) Complementary region

(B) Double helix molecule

(C) Highly conserved pattern of fold

(D) Variable loop

60. What is the angle between the D loop and the anticodon loop ?

(A) 45°

(B) 90°

(C) 135°

(D) 180°

4. Four alternative answers are mentioned for each question as—A, B, C & D in the booklet. The candidate has to choose the most correct/appropriate 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 ny 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 एक सबसे सही अथवा सबसे उपयुक्त 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।