Roll No. .....

Question Booklet Number

O. M. R. Serial No. | | | | | | | | |

M. Sc. (Biotechnology) (Second Semester)

EXAMINATION, July, 2022

MOLECULAR BIOLOGY & GENETICS

Paper Code				
MBT	2	0	0	1

Questions Booklet Series
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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)

1. The Shine-Dalgarno sequence is responsible for :

(A) binding of RNA polymerase to gene during transcription

(B) binding of DNA polymerase to origin of replication during DNA replication

(C) binding of ribosomes to mRNA during initiation of translation

(D) binding of snurps during splicing

2. Among the following which statement is correct regarding the promoter of the gene ?

(A) It is always located upstream of transcription start site

(B) It is always located downstream of translation start site

(C) Different promoter elements are recognized by different RNA polymerase

(D) Promoters are recognized due to their different secondary structures

3. During mismatch repair in E. coli, the parental strand is recognized by :

(A) single-stranded breaks

(B) glycosylated adenines

(C) methylated adenines

(D) methylation of the 6th position of guanine residues

4. Khorana *et al.* synthesized RNA with copolymer of UGUGUGUGUG..... . It produced a peptide with alternative cysteine and valine. The codons for the two are :

(A) UGU and GUG

(B) UUG and GGU

(C) GUG and UGU

(D) UGG and GUU

5. What is incorrect about RNA ?

(A) It binds with an amino acid at its 3' end

(B) It has five double-stranded regions

(C) It has an anticodon at oonen end which recognizes codon of mRNA

(D) It looks like clover leaf in 3-dimensional structure

6. A specific aminoacyl-/RNA always carries the same amino acid that is attached by a specific aminoacyl-/RNA synthetase. Regions on RNA that are required for the specificity of the enzyme is/are the :

(A) anticodon and acceptor region

(B) D loop and acceptor rgion

(C) anticodon alone

(D) The ψ C loop and anticodon

7. Which of the following is not part of the pathway for nuclear pre-mRNA splicing ?

(A) Transesterification where the 5' OH of the downstream exon attacks the donor junction

(B) Transesterification where the 2' OH of the branch point attacks the donor junction

(C) Recognition of the donor junction by the U1 snRNP

(D) Dissociation of U4 from U6

8. If a mutation occurred in the phosphorylation site in domain of RNA polymerase II, which of the following outcomes would be observed ?

(A) Transcription of /RNA would occur normally

(B) Transcription of mRNA would not occur

(C) Transcription of precursor rRNA would not occur

(D) All of the above

9. A leader sequence in mRNA of eukaryotes can be found :

(A) after the 'stop' codon

(B) between transcriptional start site and translational start site

(C) within the first exon

(D) in the exon-intron boundaries

10. In bacterial RNA synthesis, which of the following is the function of factor rho ?

(A) Allow promoter initiation of transcription

(B) Eliminate the binding of RNA polymerase to the promoter

(C) Participate in the proper termination of transcription

(D) Increase the rate of RNA synthesis

11. Which step of translation does not consume high-energy phosphate bond ?

(A) Translocation

(B) Peptidyl transferase reaction

(C) Amino acid activation

(D) Aminoacyl tRNA binding to A-site

12. Protein-binding regions of DNA are identified by one of the following techniques ?

(A) Fingerprinting

(B) Footprinting

(C) Southern blotting

(D) Western blotting

13. Antibiotic inhibiting interaction between tRNA and mRNA during protein synthesis in bacteria is :

(A) Tetracycline

(B) Neomycin

(C) Erythromycin

(D) Streptomycin

14. Which of the following is a characteristic of eukaryotic transcription but not prokaryotic transcription ?

(A) Transcription and translation are coupled

(B) There is one form of RNA polymerase

(C) RNA polymerase II is responsible for synthesis of mRNA

(D) RNAs can be polycistronic

15. Enhancer elements are known to increase the rate of transcription when present at the upstream side of the promoter sequences. If the same enhancer element is placed in reverse orientation :

(A) the rate of transcription increases as compared to upstream side

(B) the rate of transcription decreases as compared to upstream side

(C) the rate of transcription remains same as compared to upstream side

(D) no transcription is observed.

16. Which of the following processes does not take place in the 5'-3' direction ?

(A) DNA replication

(B) Transcription

(C) Nick translation

(D) RNA editing

17. A deletion of three consecutive bases in the coding region of a gene cannot result in :

(A) deletion of a single amino acid without any other change in the protein

(B) replacement of two adjacent amino acids by a single amino acid

(C) replacement of a single amino acid by another without any other change in sequence of proteins

(D) production of a truncated protein

18. Meselson and Stahl showed that DNA replication is semiconservative making use of :

(A) radioactivity

(B) centrifugation

(C) chromatography

(D) dialysis

19. Which of the following contains thymine ?

(A) mRNA

(B) rRNA

(C) RNA

(D) DNA

20. One of the following correctly represents DNA organization from least organized to most organized :

(A) DNA-nucleosomes-chromosome-looped domain

(B) DNA-looped domain-nucleosome-chromosome

(C) DNA-nucleosomes-looped domain-chromosome

(D) Nucleosomes-DNA-looped-looped domain-chromosome

21. Which sequence represents a usable pathway in the production of a secretory protein ?

(A) RER-secretory vesicles-ribosomes

(B) ribosomes-RER-Golgi apparatus-secretory vesicle

(C) secreting vesicle-Golgi apparatus-RER-secretory vesicle

(D) SER-RER-secretory vesicle-ribosomes

22. DNA synthesis requires a primer, which consists of :

(A) primase

(B) DNA

(C) RNA

(D) an okazaki fragment

23. Which of the following is found only in eukaryotic cells ?

(A) mRNA

(B) sn RNA

(C) rRNA

(D) tRNA

24. Viruses contain :

(A) DNA or RNA, ribosomes, mitochondria

(B) DNA polymerase, ribosomes, mitochondria

(C) DNA polymerase, ribosomes, protein coat

(D) DNA or RNA, protein coat

25. DNA-protein interactions are mainly because of :

(A) DNA bases and some amino acids of DNA-binding proteins

(B) Negative charge of DNA and positive charge on protein

(C) DNA are target molecules of protein

(D) DNA topology

26. A protein domain is essentially :

(A) 3-D tertiary structure

(B) super-secondary structure

(C) organizational unit of 2nd level

(D) a quaternary structure with a function

27. Gene expression control at transcription level is achieved by :

(A) recombination

(B) histone modification

(C) DNA modification

(D) all epigenetic modification

28. A DNA binding protein, associates with DNA by :

(A) H-bonding between amino acids and bases in DNA helix

(B) hydrophobic interaction

(C) covalent bonding

(D) electrostatic attraction

29. 2D-Gel analyses is a method to separate a mixture of large number of :

(A) proteins

(B) DNA

(C) RNA

(D) mRNA

30. A naturally occurring coding strand composed of alternately C and U residue would result in the formation of :

(A) A polypeptide containing alternating Leu and Ser residues

(B) A polypeptide containing either Leu or Ser

(C) A polypeptide containing only Leu

(D) A polypeptide containing only Ser

31. The relation between the fraction of repetitive DNA and the time required for reassociation of its denatured strands in a specific genome is :

(A) direct

(B) inverse

(C) hyperbolic

(D) None of the above

32. Microarray is a technique for :

(A) comparative study of gene expression at mRNA level

(B) comparative study of gene expression at protein level

(C) comparative study of gene expression at polypeptide level

(D) None of the above

33. What feature of protein can be used to predict its function ?

(A) number of amino acids

(B) overall charge of molecule

(C) molecular weight

(D) structure

34. An investigator would be able to distinguish a solution containing RNA from one containing DNA by :

(A) heating the solution to 82.5°C and measuring the absorption of light at 260 nm

(B) comparing the Tm of each solution

(C) monitoring the change in absorption of light at 260 nm while elevating the temperature

(D) measuring the absorption of light at 260 nm

35. Which among the following activates eukaryotic RNA polymerase II by the modification ?

(A) phosphorylation

(B) acetylation

(C) methylation

(D) None of the above

36. What is the arrangement of gene in an operon ?

(A) ZYX

(B) ZYA

(C) AZY

(D) YAZ

37. Telomerase has :

(A) RNA-DNA helicase activity

(B) RNA dependent DNA synthesis

(C) Sequence 3AATCCCAAT in its RNA components in humans

(D) All of the above

38. Telomerase :

(P) is a ribonucleoprotein

(Q) participates in replication of linear dsDNA

(R) is species specific

(S) is absent in somatic cells

Codes :

(A) P, Q and R

(B) P, R and S

(C) P, Q, R and S

(D) Only P

39. Choose the mismatch :

(A) Pol I-primer removal and DNA repair

(B) Pol III-DNA replication

(C) Pol V-translation replication

(D) Pol λ-nuclear DNA replication

40. TATA box is important because :

(A) it has low Tm

(B) it has high Tm

(C) it is found in RNA

(D) it has low Tm hence, its dissociation between the two DNA strands is easy

41. Thymine is found in the :

(A) DNA

(B) DNA and RNA

(C) DNA and some RNA

(D) Protein

42. Reverse transcriptase has :

(A) RNA dependent DNA polymerase function

(B) DNA dependent RNA polymerase function

(C) Both (A) and (B)

(D) been found in bacteria

43. Which of the following types of DNA replication or repair systems is dysfunctional in individuals with xeroderm pigmentosum ?

(A) mismatch repair

(B) base excision repair

(C) nucleotide excision repair

(D) DNA helicase

44. Transfer RNA is important in :

(A) synthesizing RNA codons

(B) assembling ribosomes

(C) transporting messenger RNA

(D) adding amino acids to a polypeptide

45. Proteins that bind to DNA regulate gene expression in :

(A) eukaryotes but not in prokaryotes

(B) prokaryotes but not in eukaryotes

(C) neither eukaryotes nor prokaryotes

(D) both eukaryotes and prokaryotes

46. All of the following statements about Type I topoisomerase (Topo I) are true except :

(A) topo I removes DNA supercoils in an ATP-dependent reaction

(B) topo I from eukaryotic cells can remove both positive and negative supercoils

(C) topo I from E. coli can remove only negative supercoils

(D) topo I is essential for viability in E. coli

47. DNA helicase in E. coli :

(A) moves in the direction opposite of replication fork

(B) binds with template of the leading strand

(C) is a hexametric protein with ATPase activity

(D) catalyzes formation of primer

48. Ricin, a toxic molecule isolated from Ricinus communis, inactivates eukaryotic :

(A) 28s ribosomal RNA

(B) polymerase

(C) None of the above

(D) ligases

49. Which among the following acts as the initiator codon ?

(A) AUG

(B) GUG

(C) UUG

(D) All of the above

50. The SOS repair mechanism is activated by :

(A) 5-bromouracil

(B) 2-aminopurine

(C) hydroxylamine

(D) thymine dimers

51. In Rho-independent transcription termination, stem and loop structure is formed in :

(A) the transcript

(B) the template DNA

(C) coding strand

(D) Both (A) and (B)

52. Xeroderma pigmentosum is an autosomal recessive genetic disease that causes a variety of phenotypic changes in skin cells exposed to sunlight. This disease involves a defect in which of the following DNA repair mechanisms ?

(A) base excision repair

(B) double-strand break repair

(C) mismatch repair

(D) nucleotide excision repair

53. Telomerase is ribonucleoprotein complex that synthesizes :

(A) DNA in the absence of DNA or RNA template

(B) DNA using a DNA template that is part of the ribonucleoprotein complex

(C) DNA using an RNA template that is part of the ribonucleoprotein complex

(D) DNA using ribosomal RNA as template

54. In E. coli, attenuation and antitermination utilize which structure ?

(A) Stem loop structures in RNA

(B) Stem loop structures in DNA

(C) RNA/DNA hybrids

(D) Differential protein folding

55. Choose the false statement :

(A) Peptidyl/RNA binds in the P-site

(B) Shine-Dalgarno is polypurine sequence that helps in ribosome binding

(C) Eukaryotic mRNAs are mostly monocistronic

(D) Translocation of ribosome requires ATP hydrolysis

56. How is the lariat structure formed during splicing of a GU-AG intron ?

(A) After cleavage of the 5' splice site, a new phosphodiester bond is formed between the 5' nucleotide and the 2' carbon of the nucleotide at the 3' splice site.

(B) After cleavage of the 5' splice site, a new phosphodiester bond is formed between the 5' nucleotide and the 2' carbon of an internal adenosine.

(C) After cleavage of the 3' splice site, a new phosphodiester bond is formed between the 5' nucleotide and the 2' carbon of the nucleotide at the 5' splice site.

(D) After cleavage of the 3' splice site, a new phosphodiester bond is formed between the 5' nucleotide and the 2' carbon of an internal adenosine.

57. Puffs in polytene chromosome is associated mainly with :

(A) DNA synthesis

(B) RNA synthesis

(C) Protein synthesis

(D) None of the above

58. An enhancer element shows all of the following properties except :

(A) acts as a binding site for transcription factors

(B) acts as a binding site for RNA polymerase

(C) is functional when located upstream or downstream of the transcription initiation site

(D) is functional when located in an intron

59. Which among the following is true about the origin of replication in eukaryotes ? It has :

(A) one origin of replication

(B) two origin of replication

(C) many origin of replication

(D) origin is absent

60. siRNA(s) interfere at :

(A) transcriptional level

(B) post-transcriptional level

(C) DNA replication level

(D) translational level

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।