Roll No. .....

Question Booklet Number

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

M. Sc. (Fourth Semester)

(NEP) EXAMINATION, 2025-26

BOTANY

(Advanced Genetics & Molecular Biology)

Paper Code							
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Questions Booklet Series
C

Time : 1:30 Hours] [*Maximum Marks : 75*

Instructions to the Examinee :

1. Do not open the booklet unless you are asked to do so.

   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.

2. 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. Identification of unknown microbial genes from ocean water samples is possible through :

(A) Metagenomic sequencing

(B) Western blot

(C) ELISA

(D) Gel filtration

2. Studying gene expression changes during plant stress conditions commonly uses :

(A) qRT-PCR

(B) Western blot

(C) Chromatography

(D) Dialysis

3. In genomics research, large-scale study of gene functions is called :

(A) Functional genomics

(B) Structural biology

(C) Cytology

(D) Taxonomy

4. Identification of genetic mutations responsible for inherited diseases is mainly done using :

(A) DNA sequencing

(B) ELISA

(C) Western blot

(D) Chromatography

5. To confirm the presence of a protein after gene expression, the best technique is :

(A) Western blotting

(B) Northern blotting

(C) Southern blotting

(D) DNA sequencing

6. A scientist wants to determine the transcription start site of a gene. Which method is useful ?

(A) 5′ RACE

(B) Southern blot

(C) Western blot

(D) Gel filtration

7. Environmental DNA is analyzed to study microbial diversity in soil using :

(A) Metagenomics

(B) Microarray

(C) Western blot

(D) PCR only

8. A scientist wants to study protein-protein interaction inside living cells. Which method is useful ?

(A) FRET

(B) Southern blotting

(C) DNA sequencing

(D) PCR

9. To identify the DNA binding site of a transcription factor, the most suitable technique is :

(A) DNase I footprinting

(B) Western blot

(C) PCR

(D) ELISA

10. A researcher studying DNA-protein binding in gene regulation would use :

(A) EMSA

(B) ELISA

(C) Chromatography

(D) Centrifugation

11. If a scientist wants to edit or modify a gene in an organism, which technique is most appropriate ?

(A) CRISPR genome editing

(B) Northern blotting

(C) Western blotting

(D) Protein electrophoresis

12. A researcher wants to silence a gene to study its function in a cell. Which method is used ?

(A) RNA interference (RNAi)

(B) DNA sequencing

(C) Gel electrophoresis

(D) ELISA

13. A scientist wants to compare gene expression of thousands of genes in normal and diseased tissues. Which technique is used ?

(A) Microarray

(B) PCR

(C) Western blot

(D) Chromatography

14. To identify the sequence of nucleotides in a newly discovered gene, a scientist should use :

(A) DNA sequencing

(B) Northern blotting

(C) Western blotting

(D) ELISA

15. A researcher wants to measure the expression level of a specific gene in cancer cells. Which technique is most suitable ?

(A) Southern blotting

(B) qRT-PCR

(C) DNA fingerprinting

(D) Gel filtration

16. Functional genomics techniques help scientists :

(A) Understand gene functions in biological systems

(B) Study only DNA structure

(C) Measure protein digestion

(D) Study lipid metabolism

17. RNA-based molecular techniques are important in medical research for :

(A) Studying disease-related gene expression

(B) Measuring protein digestion

(C) Studying lipid metabolism

(D) Measuring cell size

18. RNA interference (RNAi) is applied in research to :

(A) Increase gene expression

(B) Silence specific genes

(C) Replicate DNA

(D) Digest proteins

19. RNA study is important for understanding :

(A) Gene expression

(B) Cell signaling

(C) Biological pathways

(D) All of the above

20. Which method identifies the 5′ end of mRNA ?

(A) 5′ RACE

(B) Northern blot

(C) Western blot

(D) ELISA

21. Which method detects RNA size and quantity ?

(A) Northern blot

(B) Western blot

(C) Southern blot

(D) ELISA

22. Reverse transcriptase converts :

(A) RNA to DNA

(B) DNA to RNA

(C) Protein to RNA

(D) Lipid to DNA

23. 5′ RACE involves :

(A) Reverse transcription

(B) PCR amplification

(C) cDNA synthesis

(D) All of the above

24. RACE stands for :

(A) Rapid Amplification of cDNA Ends

(B) RNA Amplification Cellular Enzyme

(C) Rapid Analysis of Coding Elements

(D) RNA Coding Enzyme

25. Nuclear run-off assay measures :

(A) DNA replication

(B) Transcription activity

(C) Protein synthesis

(D) RNA degradation

26. Nuclease protection assay is used to detect :

(A) Specific RNA molecules

(B) DNA mutations

(C) Protein folding

(D) Lipid metabolism

27. Northern blot uses a labeled :

(A) DNA probe

(B) Protein probe

(C) Lipid probe

(D) Enzyme probe

28. RNA in Northern blotting is separated by :

(A) Agarose gel electrophoresis

(B) Centrifugation

(C) Chromatography

(D) Filtration

29. Northern blotting is used to detect :

(A) DNA

(B) RNA

(C) Proteins

(D) Lipids

30. mRNA level in a cell indicates :

(A) Gene activity

(B) DNA mutation

(C) Protein folding

(D) Lipid formation

31. RNA analysis helps to study :

(A) Protein digestion

(B) Gene expression

(C) Lipid metabolism

(D) Cell division

32. Which technique measures energy transfer between fluorophores ?

(A) Pull-down assay

(B) FRET

(C) Western blot

(D) Southern blot

33. Which technique uses beads to isolate interacting proteins ?

(A) Pull-down assay

(B) FRET

(C) Microarray

(D) PCR

34. FRET stands for :

(A) Fluorescence Resonance Energy Transfer

(B) Functional Resonance Energy Test

(C) Fluorescence Reaction Energy Transfer

(D) Functional Radiation Energy Technique

35. If bait and prey proteins interact :

(A) Cell dies

(B) Reporter gene is activated

(C) DNA is cut

(D) RNA is destroyed

36. Yeast two-hybrid assay is used to detect :

(A) DNA mutations

(B) Protein-protein interactions

(C) RNA synthesis

(D) DNA replication

37. The interacting protein in pull-down assay is called :

(A) Bait

(B) Prey

(C) DNA probe

(D) Antibody

38. Pull-down assay is used to study :

(A) DNA-DNA interaction

(B) Protein-protein interaction

(C) RNA-RNA interaction

(D) DNA replication

39. Studying protein–protein interactions helps to understand :

(A) Cell signaling

(B) Gene regulation

(C) Biological pathways

(D) All of the above

40. Metagenomics does not require :

(A) Culturing microorganisms

(B) DNA extraction

(C) Sequencing

(D) Bioinformatics analysis

41. Metagenomics helps study :

(A) Microbial communities

(B) Human organs

(C) Plant leaves

(D) Animal tissues

42. A common genome editing tool is :

(A) PCR

(B) CRISPR-Cas9

(C) Centrifuge

(D) Western blot

43. Genome editing allows :

(A) Reading DNA

(B) Precise modification of genes

(C) Protein digestion

(D) RNA synthesis

44. Mutagenesis is used to :

(A) Study gene function

(B) Destroy cells

(C) Produce proteins

(D) Remove DNA

45. Two common RNAi molecules are :

(A) mRNA and rRNA

(B) siRNA and miRNA

(C) tRNA and rRNA

(D) DNA and RNA

46. RNAi uses :

(A) Small RNA molecules

(B) Proteins only

(C) Lipids

(D) DNA enzymes

47. RNA interference is a process that :

(A) Activates genes

(B) Silences genes

(C) Copies DNA

(D) Repairs DNA

48. qRT-PCR uses :

(A) Fluorescent dyes or probes

(B) Antibodies

(C) Lipids

(D) Enzymes only

49. qRT-PCR is used to measure :

(A) DNA size

(B) Gene expression

(C) Protein weight

(D) Cell number

50. Functional genomics helps understand :

(A) How genes work in cells

(B) Cell size

(C) Lipid synthesis

(D) Water balance

51. Nanopore sequencing can sequence :

(A) DNA only

(B) RNA only

(C) Both DNA and RNA

(D) Proteins

52. Nanopore sequencing reads DNA by :

(A) Chemical reaction

(B) Electrical signal changes

(C) Heat detection

(D) Light absorption

53. Pyrosequencing is based on detection of :

(A) Light

(B) Heat

(C) Sound

(D) Color

54. Absence of 3′ OH group causes :

(A) DNA elongation

(B) DNA replication

(C) Chain termination

(D) Protein synthesis

55. In Sanger sequencing, chain termination occurs due to :

(A) dNTP

(B) ddNTP

(C) ATP

(D) RNA

56. DNA sequencing means :

(A) Cutting DNA

(B) Determining order of nucleotides

(C) Joining DNA fragments

(D) Repairing DNA

57. First step in Southern blotting is :

(A) Hybridization

(B) DNA extraction and restriction digestion

(C) PCR

(D) Staining

58. Southern blotting was developed by :

(A) Frederick Sanger

(B) Edwin Southern

(C) Watson

(D) Crick

59. Which technique is used to detect specific DNA fragments ?

(A) Western blot

(B) Southern blot

(C) Northern blot

(D) ELISA

60. Molecular analysis of genes mainly studies :

(A) Cell structure

(B) DNA and gene function

(C) Lipids

(D) Proteins only

61. EMSA stands for :

(A) Enzyme Mobility Study Assay

(B) Electrophoretic Mobility Shift Assay

(C) Electrophoretic Molecular Separation Assay

(D) Enzyme Shift Molecular Assay

62. DNA-protein interactions mainly occur in the :

(A) Cell membrane

(B) Cytoplasm

(C) Nucleus

(D) Vacuole

63. DNA-protein interaction means :

(A) DNA binding with RNA

(B) DNA binding with proteins

(C) DNA binding with lipids

(D) DNA binding with carbo-hydrates

64. Footprinting pattern disappears if :

(A) Protein is removed

(B) DNA is labeled

(C) Gel is stained

(D) Enzyme is added

65. DNase footprinting shows :

(A) Missing bands

(B) Extra bands

(C) Shifted bands

(D) Colored bands

66. Protein binding protects DNA from :

(A) Heat

(B) DNase digestion

(C) UV light

(D) Chemical damage

67. Protected region on gel is called :

(A) Shift

(B) Footprint

(C) Band

(D) Gap

68. DNase I is an enzyme that :

(A) Cuts RNA

(B) Cuts DNA

(C) Joins DNA

(D) Copies DNA

69. Immunoprecipitation uses :

(A) DNA probe

(B) RNA probe

(C) Specific antibody

(D) Enzyme

70. Cross-linking is done using :

(A) Heat

(B) Formaldehyde

(C) Alcohol

(D) Acid

71. ChIP is a/an :

(A) In vitro technique

(B) In vivo technique

(C) Chemical method

(D) Physical method

72. ChIP is used to study :

(A) DNA-DNA interaction

(B) DNA-protein interaction in cells

(C) RNA-protein interaction

(D) Protein folding

73. EMSA is qualitative because it mainly shows :

(A) Quantity

(B) Presence or absence

(C) DNA sequence

(D) Mutation

74. A shifted band indicates :

(A) Free DNA

(B) DNA degradation

(C) DNA-protein binding

(D) RNA contamination

75. In EMSA, DNA-protein complex moves :

(A) Faster than free DNA

(B) Same as free DNA

(C) Slower than free DNA

(D) Randomly

76. EMSA is used to study :

(A) DNA-RNA interaction

(B) DNA-protein interaction

(C) Protein-protein interaction

(D) RNA-RNA interaction

77. Reporter gene assays are mainly used to study :

(A) DNA replication

(B) Gene regulation

(C) Cell division

(D) Mutation

78. In situ hybridization helps to know :

(A) Amount of protein

(B) DNA sequence

(C) Location of gene expression

(D) Enzyme activity

79. Northern blotting is used to detect :

(A) DNA

(B) Protein

(C) RNA

(D) Lipids

80. Which tool gives the most detailed information about gene expression ?

(A) RT-PCR

(B) Microarray

(C) RNA sequencing (RNA-Seq)

(D) Northern blot

81. Microarray technique is useful because it can :

(A) Study only one gene

(B) Study thousands of genes at once

(C) Cut DNA

(D) Repair RNA

82. RT-PCR is used to study gene expression by using :

(A) DNA directly

(B) RNA converted to DNA

(C) Protein samples

(D) Lipids

83. Gene expression means :

(A) Making DNA

(B) Making RNA and proteins from genes

(C) Breaking DNA

(D) Joining chromosomes

84. DNA methylation is the addition of :

(A) Acetyl group to histones

(B) Methyl group to DNA

(C) Phosphate group to DNA

(D) Protein to DNA

85. Histone acetylation usually makes chromatin :

(A) More compact

(B) Loosely packed

(C) Destroyed

(D) Mutated

86. Chromatin modelling refers to :

(A) Change in DNA sequence

(B) Packing and unpacking of chromatin

(C) DNA replication

(D) Protein synthesis

87. In agriculture, epigenetics helps in :

(A) Making chemicals

(B) Improving crop traits

(C) Studying stars

(D) Measuring soil pH

88. In cancer, epigenetic changes can cause :

(A) Gene deletion

(B) Abnormal gene activation or silencing

(C) DNA replication

(D) Protein digestion

89. Which of the following is an example of epigenetic change ?

(A) Gene mutation

(B) DNA replication

(C) DNA methylation

(D) Transcription

90. What is epigenetics ?

(A) Change in DNA sequence

(B) Study of genes only

(C) Change in gene expression without changing DNA sequence

(D) Mutation in DNA

91. Two DNA strands are held together by :

(A) Covalent bonds

(B) Hydrogen bonds

(C) Peptide bonds

(D) Ionic bonds

92. A nucleotide is made of :

(A) Sugar, phosphate, and base

(B) Sugar and base only

(C) Protein and base.

(D) Sugar and protein

93. Which DNA is repeated many times in the genome ?

(A) Structural DNA

(B) Unique DNA

(C) Repetitive DNA

(D) Coding DNA

94. What is chromatin ?

(A) DNA only

(B) Protein only

(C) DNA + protein complex

(D) RNA + protein complex

95. What helps pack DNA tightly in eukaryotic cells ?

(A) RNA

(B) Histone proteins

(C) Enzymes

(D) Lipids

96. What is non-coding DNA ?

(A) DNA that makes proteins

(B) DNA with no function

(C) DNA that does not code for proteins

(D) DNA found only in bacteria

97. Which of the following is a part of genome organization ?

(A) Genes

(B) Non-coding DNA

(C) Repeated DNA

(D) All of the above

98. What are genes ?

(A) Non-coding DNA only

(B) Segments of DNA that code for proteins

(C) RNA molecules

(D) Parts of ribosomes

99. What is DNA mainly made of ?

(A) Amino acids

(B) Fatty acids

(C) Nucleotides

(D) Sugars only

100. What is a genome ?

(A) A single gene

(B) All the DNA in an organism

(C) Only protein-coding DNA

(D) A type of cell

(Only for Rough Work)

3. 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.

4. Each question carries equal marks. Marks will be awarded according to the number of correct answers you have.
5. 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.
6. Before writing anything on the OMR Answer Sheet, all the instructions given in it should be read carefully.
7. 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.
8. There will be no negative marking.
9. Rough work, if any, should be done on the blank pages provided for the purpose in the booklet.
10. To bring and use of log-book, calculator, pager and cellular phone in examination hall is prohibited.
11. 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।