

Roll. No.

Question Booklet Number

O.M.R. Serial No.

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M.Sc. (SEM.-IV) (NEP) (SUPPLE.) EXAMINATION, 2024-25

BOTANY

(Microbial Genetics)

Paper Code

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**Question Booklet
Series**

A

Time : 1 : 30 Hours

Max. 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.
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 :

(Remaining instructions on last page)

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, उसे तुरन्त बदल लें।
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 छानना है। उत्तर को OMR उत्तर-पत्रक में सम्बन्धित प्रश्न संख्या में निम्न प्रकार भरना है :

(शेष निर्देश अन्तिम पृष्ठ पर)

1. Cyclin is associated with ?
 - (A) Mitosis
 - (B) Leptospirosis
 - (C) Glycolysis
 - (D) Cyclosis
2. Chromosome structure can be observed best during :
 - (A) Prophase
 - (B) Anaphase
 - (C) Metaphase
 - (D) Both (A) and (B)
3. Transposons were first discovered in :
 - (A) Maize
 - (B) Bacteria
 - (C) Mice
 - (D) Rice
4. Who proposed holiday model for homologous recombination ?
 - (A) Hargobind Khorana
 - (B) Louis Pasfenr
 - (C) Robin Holiday
 - (D) Niels Bohr
5. What is the name of the site where Cre enzyme acts ?
 - (A) COX
 - (B) LOX
 - (C) AOX
 - (D) XOP
6. The sequences of the recombination sites recognized by site specific recombinases are :
 - (A) Non-palin dromic
 - (B) Partially symmetric
 - (C) Symmetric
 - (D) Palindromic
7. Which of the following is an example of an inducible operon ?
 - (A) trp operon
 - (B) lac operon
 - (C) ara operon
 - (D) his operon
8. The lac operon is turned off is the presence of :
 - (A) High lactose, low glucose
 - (B) Low lactose, high glucose
 - (C) High lactose, high glucose
 - (D) Low lactose, low glucose
9. Which bacterium uses quorum sensing to regulate virulence ?
 - (A) Escherichid coli
 - (B) Vibrio cholerae
 - (C) Bacillus subtilis
 - (D) Cyanobacteria

10. Heat shock proteins (HSPs) functions as :
- (A) Toxins
 - (B) Chaperones
 - (C) Ribosomes
 - (D) DNA helicases
11. Virulence gene expression in bacteria is controlled by :
- (A) Random mutations
 - (B) Environmental signals
 - (C) Photosynthesis
 - (D) Host DNA
12. What triggers the SOS response in bacteria ?
- (A) DNA damage
 - (B) Low oxygen levels
 - (C) High glucose concentration
 - (D) Cold temperature
13. What is plasmid ?
- (A) A circular DNA molecule in bacteria
 - (B) A type of virus
 - (C) A bacterial cell wall component
 - (D) A protein in fungi
14. Which enzyme is used to join DNA fragments in genetic engineering ?
- (A) DNA polymerase
 - (B) Ligase
 - (C) Amylase
 - (D) Lipase
15. Which bacterial genus forms symbiotic root nodules in non-leguminous plants like casuarina ?
- (A) Azospirillum
 - (B) Frankia
 - (C) Bacillus
 - (D) Pseudomonas
16. Which bacteriophage is commonly used for generalized transduction ?
- (A) T4
 - (B) λ (Lambda)
 - (C) P1
 - (D) QX174
17. The lysogenic cycle λ phase is maintained by which protein ?
- (A) CsO
 - (B) N
 - (C) CI repressor
 - (D) Q
18. Filamentous phage M13 is useful in genetic engineering because it :
- (A) Transfer plasmid
 - (B) Production single-stranded DNA
 - (C) Causes bacterial lysis
 - (D) Acts only in generalized transduction

19. The first DNA genome ever sequenced completely belonged to :
- (A) P1 phage
 - (B) PX 174
 - (C) λ phage
 - (D) T4 phage
20. T4 bacteriophage is often used in microbial genetic because it :
- (A) Has a double-stranded RNA genome
 - (B) Undergoes only lysogeny
 - (C) Has a large genome useful for mapping studies
 - (D) Produces single-stranded DNA vectors
21. Most abundant transposable elements in higher eukaryotes ?
- (A) Trans posons
 - (B) Retro transposons
 - (C) IS elements
 - (D) Composite elements
22. Bacterial IS elements include :
- (A) Transposase gene
 - (B) The inverted terminal repeats
 - (C) The target site duplication
 - (D) All of the above
23. The transposable elements of bacteria are generally retrotransposons.
- (A) True
 - (B) False
 - (C) Either true or false
 - (D) Neither true or false
24. Which of the following organisms consists of single-stranded DNA ?
- (A) Fungi
 - (B) Viruses
 - (C) Protozoa
 - (D) Eukaryotes
25. When uncharged t-RNA concentration is low what will you expect as the activity of tryptophan operon ?
- (A) Low
 - (B) Medium
 - (C) High
 - (D) Very high
26. Tryptophan's presence has a :
- (A) Positive feedback
 - (B) Negative feedback
 - (C) No difference
 - (D) Highly positive impact

27. The sequence of the structural genes in the lac operon is :
- (A) lac A – lac Z – lac Y
 - (B) lac Z – lac Y – lac A
 - (C) lac Z – lac A – lac Y
 - (D) lac A – lac Y – lac Z
28. Which of the following nutrients plays a crucial role in amino acid and protein synthesis ?
- (A) Carbon
 - (B) Nitrogen
 - (C) Phosphorus
 - (D) Sulphur
29. Which of the following best describe bacteriophage T_4 ?
- (A) A lysogenic phage
 - (B) Filamentous phage
 - (C) A lytic ds DNA phage
 - (D) A Single-stranded RNA phage
30. The host bacterium of both T_4 and lambda phages is :
- (A) *Pseudomonas aeruginosa*
 - (B) *Escherichia coli*
 - (C) *Bacillus subtilis*
 - (D) *Staphylococcus aureus*
31. *Neurospora crassa* is commonly known as :
- (A) Bread mold
 - (B) Pink mold
 - (C) Red bread mold
 - (D) Green mold
32. The famous 'One gene-one enzyme' hypothesis was proposed using :
- (A) *Escherichia coli*
 - (B) *Neurospora crassa*
 - (C) *Saccharomyces cerevisiae*
 - (D) *Aspergillus niger*
33. Which medium was used by Beadle and Tatum to identify nutritional mutants in *Neurospora* ?
- (A) Minimal medium
 - (B) Complex medium
 - (C) Selective medium
 - (D) Differential medium
34. The genome of *Neurospora crassa* is approximately :
- (A) 10 Mb
 - (B) 20 Mb
 - (C) 40 Mb
 - (D) 100 Mb
35. *Neurospora crassa* is mainly used to study :
- (A) Genetic recombination
 - (B) Nutritional genetics and biochemical pathway
 - (C) Antibiotic resistance
 - (D) Viral infection

36. Extra chromosomal DNA in bacteria is most commonly present as :
- Mitochondrial DNA
 - Plasmids
 - Chromatids
 - Histones
37. Extrachromosomal DNA that confers resistances to antibiotics in bacteria is called :
- Col plasmid
 - R plasmid
 - F plasmid
 - Ti plasmid
38. Which of the following is an important function of extrachromosomal plasmid DNA in biotechnology ?
- Protein translation
 - Acting as a cloning vector
 - Ribosome synthesis
 - DNA packaging in nucleus
39. The plasmid used by agrobacterium tumefaciens for gene transfer in plants is :
- R plasmid
 - Ti plasmid
 - Col plasmid
 - F plasmid
40. Extrachromosomal circular DNA fragments found in eukaryotic cells, especially in cancer are called :
- Ebisome
 - Extrachromosomal circular DNA (eco DNA)
 - Minichromosomes
 - Virions
41. Transposition can lead to :
- Mutations
 - Gene disruption
 - Spread of antibiotic resistance
 - All of the above
42. Transposons are also called :
- Jumping genes
 - Palindrome genes
 - Silent genes
 - Split genes
43. Which enzyme is essential for transposition ?
- Ligase
 - Polymerase
 - Transposase
 - Restriction enzyme

44. Which scientist first discovered transposable elements (in Maize) ?
- (A) Joshua Lederberg
(B) Barbara McClintock
(C) Edward Tatum
(D) Salvador Luria
45. The movement of a transposon from one site to another is called :
- (A) Integration
(B) Translocation
(C) Transposition
(D) Transformation
46. The simplest type of transposable element is :
- (A) Composite transposon
(B) Insertion sequence (IS elements)
(C) Retrotransposon
(D) Tn3 transposon
47. Which bacterial component is required for conjugation ?
- (A) Flagella
(B) Pili
(C) Capsule
(D) Ribosome
48. Which tool is used to study gene expression in bacteria ?
- (A) DNA sequencing
(B) Microarrays
(C) PCR
(D) Gel electrophoresis
49. Which of the following plant receptors detects light signals ?
- (A) Phytochromes
(B) Histone proteins
(C) Transposases
(D) Helicases
50. Which plant hormone is primarily involved in stress responses such as drought ?
- (A) Gibberellin
(B) Auxin
(C) Absciscic acid
(D) Cytokinin
51. Genetic recombination in bacteria can occur by all of the following except :
- (A) Transformation
(B) Transduction
(C) Conjugation
(D) Binary fission
52. Which protein resolves Holiday junctions in bacteria ?
- (A) Rec A
(B) Ruv C endonuclease
(C) DNA ligase
(D) Gyrase

53. The introduction of foreign DNA into a bacterium by uptake from the environment is called :
- (A) Conjugation
 - (B) Transformation
 - (C) Transduction
 - (D) Transposition
54. The Holliday model of recombination was proposed in :
- (A) 1953
 - (B) 1964
 - (C) 1975
 - (D) 1983
55. A key intermediate structure in the Holliday model is :
- (A) Replication fork
 - (B) Holliday junction
 - (C) Okazaki fragment
 - (D) Telomere loop
56. The Meselson-Radding model was proposed in :
- (A) 1964
 - (B) 1975
 - (C) 1983
 - (D) 1990
57. Gene conversion refers to :
- (A) Exchange of DNA between different organisms
 - (B) Non-reciprocal transfer of genetic information
 - (C) Equal crossover between homologous DNA
 - (D) RNA-DNA information flow
58. Gene conversion has been studied extensively in which organism ?
- (A) E Coli
 - (B) *Neurospora crassa*
 - (C) *Arabidopsis thaliana*
 - (D) *Saccharomyces cerevisiae*
59. Gene conversion can occur without :
- (A) Homologous recombination
 - (B) Crossing over
 - (C) Strand invasion
 - (D) DNA repair enzymes
60. The abnormal 3:1 ratio instead of the expected 2:2 segregation in fungi is due to :
- (A) Gene duplication
 - (B) Gene conversion
 - (C) Independent assortment
 - (D) Mutation during mitosis

61. Which bacterial gene cluster is essential for *Rhizobium* to establish symbiosis with legumes ?
- (A) nif genes
 - (B) nod genes
 - (C) Vir genes
 - (D) lux genes
62. The nif gene cluster in bacteria encodes enzymes required for :
- (A) Root hair curling
 - (B) Nod factor synthesis
 - (C) Nitrogen fixation
 - (D) Phytohormone production
63. Which bacterial genus is an associative nitrogen fixer and often studied for its genetics of plant growth promotion ?
- (A) *Bacillus*
 - (B) *Azotobacter*
 - (C) *Azospirillum*
 - (D) *Pseudomonas*
64. In microbial genetics, nod factors are recognized by :
- (A) Plant receptors coded by bacterial plasmids
 - (B) Plant lysosomes
 - (C) Plant receptor kinases on root hairs
 - (D) Bacterial ribosomes
65. Which plant-microbe association represents a mutualistic genetic interaction ?
- (A) *Xanthomonas* – crucifers
 - (B) *Rhizobium* – Legumes
 - (C) *Agrobacterium* – Dicot plants
 - (D) *Pseudomonas syringae* – Tomato
66. The crown gall diseases results from stable integration of which bacterial DNA segment into the plant genome ?
- (A) Entire Ti plasmid
 - (B) Vir region
 - (C) T-DNA segment
 - (D) Nod gene cluster
67. Flavonoids secreted by legumes activate expression of :
- (A) nif genes
 - (B) nod genes
 - (C) vir genes
 - (D) lux genes
68. Plant root hair curling is triggered by :
- (A) Nod factor perception by receptor kinases
 - (B) Bacterial nitrogenase activity
 - (C) Opine synthesis
 - (D) Quorum sensing in bacteria

69. Plant receptor-like kinases (RLKs) detect bacterial signals primarily at :
- (A) Cell wall matrix
 - (B) Plasma membrane
 - (C) Nucleus
 - (D) Vacuole
70. The host specificity in *Agrobacterium tumefaciens* infection is mainly determined by :
- (A) Type of vir genes
 - (B) Structure of T-DNA
 - (C) Plant produced phenolics
 - (D) Type of nod factor
71. In molecular cloning *E. coli* is most widely used as :
- (A) Donor of nitrogenase genes
 - (B) Host organism for plasmid propagation
 - (C) Producer of nod factors
 - (D) Plant growth-promoting bacterium
72. Restriction endonucleases essential for recombinant DNA technology, are naturally produced by :
- (A) Fungi
 - (B) Bacteria
 - (C) Viruses
 - (D) Cyanobacteria
73. Which virus is widely used as a cloning vector in plants ?
- (A) Lambda phage
 - (B) Cauliflower Mosaic Virus (CAMV)
 - (C) Adenovirus
 - (D) Retrovirus
74. Which bacterium is used in Bt crops for insect resistance ?
- (A) *Rhizobium*
 - (B) *Bacillus thuringiensis*
 - (C) *Pseudomonas syringae*
 - (D) *Clostridium botulinum*
75. In golden rice production, genes for β carotene biosynthesis were introduced using :
- (A) *Agrobacterium tumefaciens*
 - (B) *Pseudomonas syringae*
 - (C) *Rhizobium*
 - (D) *Bacillus thuringiensis*
76. The first genetically engineered vaccine (Hepatitis B) was produced in :
- (A) *E. coli*
 - (B) *Saccharomyces cerevisiae*
 - (C) *Agrobacterium*
 - (D) *Pseudomonas fluorescens*

77. Which microbe is used in RNA interference (RNAi) based biocontrol in plants?
- (A) *Agrobacterium tumefaciens*
 (B) *Pseudomonas fluorescens*
 (C) *Bacillus thuringiensis*
 (D) *E. coli*
78. Which bacterium is called the "Natural Genetic Engineer" of plants?
- (A) *E. coli*
 (B) *Agrobacterium tumefaciens*
 (C) *Bacillus thuringiensis*
 (D) *Rhizobium leguminosarum*
79. Which microbe is used to produce human insulin by recombinant DNA technology?
- (A) *Agrobacterium*
 (B) *E. coli*
 (C) *Saccharomyces cerevisiae*
 (D) *Pseudomonas*
80. Restriction enzymes are also called :
- (A) Polymerases
 (B) Genetic scissors
 (C) DNA ligases
 (D) Shuttle vectors
81. The enzyme that joins DNA fragments in cloning experiments is :
- (A) DNA polymerase
 (B) DNA ligase
 (C) Restriction endonuclease
 (D) Reverse transcriptase
82. Which microorganism is used in 'gene gun' transformation as a source of gold tungsten particles coated with DNA?
- (A) None, it is a mechanical method
 (B) *Agrobacterium*
 (C) *E. coli*
 (D) *Bacillus thuringiensis*
83. Which of the following best describes the type of mutation caused by transposons?
- (A) Silent mutation
 (B) Frame-shift mutation
 (C) Nonsense mutation
 (D) All of the above
84. What is the first step in homologous recombination?
- (A) Strand invasion
 (B) Formation of holiday junction
 (C) DNA synthesis
 (D) Formation of single-strand-nicks
85. Gene conversion typically occurs during which phase of the cell cycle?
- (A) G_1 phase
 (B) S phase
 (C) G_2 phase
 (D) Meiosis

86. Which enzyme converts nitrate (NO_3^-) to nitrite (NO_2^-) in plants?
- (A) Nitrogenase
(B) Nitrate reductase
(C) Glutamine synthetase
(D) Nitrite oxidase
87. Which of the following is a known example of gene conversion in humans?
- (A) ABO blood group variations
(B) β -globin gene mutations in sickle cell anemia
(C) Ribosomal RNA gene duplication
(D) None of these
88. Which bacterium provides toxin genes for pest-resistant plants?
- (A) Rhizobium
(B) Agrobacterium
(C) Bacillus Thuringiensis
(D) E. Coli
89. The Human Genome Project extensively used which microbial enzyme:
- (A) Reverse transcriptase
(B) Restriction endonuclease
(C) Taq DNA polymerase
(D) DNA ligase
90. A transgenic organism is one that:
- (A) Contains genes from the same species
(B) Contains genes from another species
(C) Contains be genetically modified
(D) Always shows mutations naturally
91. Which of the following is the first messenger in cell signaling?
- (A) cAMP
(B) ATP
(C) Epinephrine
(D) Calcium ions
92. Which of the following is not a second messenger?
- (A) cAMP
(B) Calcium ions (Ca^{++})
(C) IP_3 (Inositol triphosphate)
(D) Insulin

93. Cell signaling is mainly used for :
- (A) Producing ATP
 - (B) Communication between cells
 - (C) Breaking down food
 - (D) Forming DNA
94. The molecule that binds to a receptor is called :
- (A) Hormone
 - (B) Ligand
 - (C) Enzyme
 - (D) Substrate
95. Which of these is a protein hormone?
- (A) Cortisol
 - (B) Estrogen
 - (C) Insulin
 - (D) Testosterone
96. The main purpose of second messengers is to :
- (A) Destroy the receptor
 - (B) Carry the signal inside the cell
 - (C) Produce glucose
 - (D) Stop signaling
97. Which type of signaling involves a neuron?
- (A) Synaptic signaling
 - (B) Endocrine signaling
 - (C) Paracrine signaling
 - (D) Direct contact signaling
98. Which hormone is released when blood glucose levels are high?
- (A) Glucagon
 - (B) Insulin
 - (C) Epinephrine
 - (D) Cortisol
99. The main target organ of glucagon during fasting is :
- (A) Brain
 - (B) Liver
 - (C) Muscle
 - (D) Kidney
100. When nutrient levels are low, which hormone is secreted to raise blood glucose?
- (A) Insulin
 - (B) Glucagon
 - (C) Growth hormone
 - (D) Thyroxine

Rough Work / रफ कार्य

Example :

Question :

Q.1 (A) ● (C) (D)

Q.2 (A) (B) ● (D)

Q.3 (A) ● (C) (D)

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 & 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.

उदाहरण :

प्रश्न :

प्रश्न 1 (A) ● (C) (D)

प्रश्न 2 (A) (B) ● (D)

प्रश्न 3 (A) ● (C) (D)

5. प्रत्येक प्रश्न के अंक समान हैं। आपके जितने उत्तर सही होंगे, उन्हीं के अनुसार अंक प्रदान किये जायेंगे।
6. सभी उत्तर केवल ओ०एम०आर० 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. ओ०एम०आर० 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 में, रफ-कार्य के लिए दिए खाली पेज पर ही किया जाना चाहिए।
11. परीक्षा-कक्ष में लॉग-बुक, कैल्कुलेटर, 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 प्रश्नपुस्तिका के सभी पृष्ठ भलीभाँति छपे हुए हैं। यदि प्रश्नपुस्तिका में कोई कमी हो, तो कक्षनिरीक्षक को दिखाकर उसी सिरिज की दूसरी प्रश्नपुस्तिका प्राप्त कर लें।