Roll No. .....

Question Booklet Number

O. M. R. Serial No.

M. Sc. (Biochemistry) (Fourth Semester) EXAMINATION, 2025-26

(New Syllabus Effective from 2023)

CELL AND TISSUE CULTURE

Paper Code								
L	0	2	1	0	0	3	T	(N)

Questions Booklet Series
A

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. Which of the following best explains totipotency ?

(A) Ability to divide

(B) Ability to differentiate

(C) Ability to regenerate whole plant

(D) Ability to mutate

2. Dedifferentiation refers to :

(A) Cell death

(B) Mature cells becoming meristematic

(C) Formation of embryos

(D) DNA replication

3. Redifferentiation results in :

(A) Callus formation

(B) Organ formation

(C) Cell death

(D) Mutation

4. Which hormone combination induces callus formation ?

(A) High auxin only

(B) High cytokinin only

(C) Balanced auxin and cytokinin

(D) No hormones

5. A highly organized tissue in vitro is called :

(A) Callus

(B) Organ culture

(C) Suspension

(D) Protoplast

6. Suspension cultures are maintained in :

(A) Solid medium

(B) Dry condition

(C) Gas phase

(D) Liquid medium

7. Which factor is MOST critical for aseptic culture ?

(A) Light

(B) Temperature

(C) Sterilization

(D) pH

8. Which explant has highest regeneration potential ?

(A) Meristem

(B) Mature leaf

(C) Root tip

(D) Stem bark

9. Callus formation is an example of :

(A) Differentiation

(B) Dedifferentiation

(C) Mutation

(D) Growth inhibition

10. Which condition favors embryogenesis over organogenesis ?

(A) High cytokinin

(B) Low auxin

(C) Specific stress signals

(D) No nutrients

11. Somatic embryos differ from zygotic embryos in :

(A) Structure

(B) Origin

(C) Function

(D) Development

12. Direct organogenesis avoids :

(A) Somaclonal variation

(B) Growth

(C) Differentiation

(D) Cell division

13. Sucrose is used in medium as :

(A) Hormone

(B) Carbon source

(C) Enzyme

(D) Buffer

14. Root formation is stimulated by :

(A) Cytokinin

(B) ABA

(C) Ethylene

(D) Auxin

15. Hormonal imbalance results in :

(A) Stable growth

(B) Abnormal differentiation

(C) No growth

(D) DNA replication

16. Which hormone delays senescence ?

(A) Auxin

(B) ABA

(C) Cytokinin

(D) Ethylene

17. Micropropagation is useful for :

(A) Mutation

(B) Mass cloning

(C) DNA sequencing

(D) Selection

18. Meristem culture is used to :

(A) Increase mutation

(B) DNA replication

(C) Enhance growth

(D) Remove viruses

19. Liquid nitrogen temperature is :

(A) 0°C

(B) –196°C

(C) –50°C

(D) 100°C

20. Hardening is required to :

(A) Adapt plantlets to environment

(B) Increase growth

(C) Sterilize plants

(D) Induce mutation

21. Secondary metabolites include :

(A) DNA

(B) Alkaloids

(C) RNA

(D) Lipids

22. Synthetic seeds are :

(A) Encapsulated embryos

(B) Natural seeds

(C) DNA

(D) Cells

23. Somatic embryogenesis is useful for :

(A) Mutation

(B) Selection

(C) DNA repair

(D) Clonal propagation

24. Tissue culture helps in conservation of :

(A) Genes

(B) Rare plants

(C) DNA

(D) Proteins

25. Virus elimination is possible due to :

(A) Heat

(B) Hormones

(C) Meristem culture

(D) Mutation

26. Growth in suspension culture requires :

(A) Static condition

(B) Agitation

(C) Dry condition

(D) Heat

27. Somatic embryos can develop into :

(A) Roots only

(B) Callus

(C) Leaves

(D) Whole plants

28. Long-term callus culture leads to :

(A) Stability

(B) No growth

(C) Genetic variation

(D) Uniformity

29. Embryo rescue helps in :

(A) Hybrid survival

(B) Normal seeds

(C) Mutation

(D) Growth

30. Cybrids are important for :

(A) Nuclear gene transfer

(B) Mutation

(C) Cytoplasmic gene transfer

(D) DNA replication

31. Optimal pH for culture medium is around :

(A) 3

(B) 5.8

(C) 7.5

(D) 9

32. Light influences mainly :

(A) Callus formation

(B) Root growth

(C) DNA replication

(D) Shoot differentiation

33. Totipotency refers to :

(A) Cell death

(B) Ability to form whole plant

(C) Mutation

(D) Differentiation

34. High auxin : cytokinin ratio results in :

(A) Shoots

(B) Roots

(C) Callus

(D) Embryos

35. MS medium stands for :

(A) Murashige and Skoog

(B) Molecular solution

(C) Micro system

(D) Medium solution

36. Somaclonal variation is :

(A) Genetic uniformity

(B) Variation in cultured plants

(C) Mutation only

(D) Stability

37. Protoplast is :

(A) Cell with wall

(B) Colorful Tissue

(C) Dead cell

(D) Cell without wall

38. Cybrids are formed by :

(A) DNA recombination

(B) Cytoplasmic fusion

(C) Mutation

(D) Transformation

39. Embryo culture is useful in :

(A) Sterilization

(B) Growth

(C) Mutation

(D) Hybrid rescue

40. Haploid plants can be produced via :

(A) Callus

(B) Root culture

(C) Anther culture

(D) Leaf culture

41. Secondary metabolites are produced in :

(A) Callus culture

(B) Suspension culture

(C) Both (A) and (B)

(D) None of the above

42. Somatic embryos resemble :

(A) Roots

(B) Zygotic embryos

(C) Shoots

(D) Leaves

43. Tissue culture is useful for :

(A) Cloning

(B) Breeding

(C) Conservation

(D) All of the above

44. Agrobacterium tumefaciens causes :

(A) Root nodules

(B) Crown gall disease

(C) Leaf spots

(D) Rust

45. Ti plasmid stands for :

(A) Tumor-inducing plasmid

(B) Transfer plasmid

(C) Transformation plasmid

(D) Tissue plasmid

46. T-DNA is :

(A) Bacterial DNA

(B) Transferred DNA

(C) Tumor DNA

(D) Template DNA

47. T-DNA integrates into :

(A) Bacterial genome

(B) Plant genome

(C) Animal genome

(D) Virus

48. Vir genes are involved in :

(A) DNA replication

(B) Mutation

(C) Translation

(D) DNA transfer

49. Opines are :

(A) Proteins

(B) Unusual amino acids

(C) Sugars

(D) Lipids

50. Binary vector system uses :

(A) One plasmid

(B) Three plasmids

(C) No plasmid

(D) Two plasmids

51. Disarmed Ti plasmid lacks :

(A) Vir genes

(B) Tumor genes

(C) T-DNA

(D) Origin

52. Selectable marker gene example is :

(A) GFP

(B) DNA

(C) nptII

(D) RNA

53. Reporter gene example is :

(A) nptll

(B) GUS

(C) Antibiotic

(D) DNA

54. Vir genes are activated by :

(A) Light

(B) Plant wound signals

(C) Heat

(D) Oxygen

55. Acetosyringone induces :

(A) Vir genes

(B) Growth

(C) Mutation

(D) DNA repair

56. T-DNA borders are :

(A) Protein

(B) RNA

(C) Lipids

(D) Repeats

57. Agrobacterium transfers DNA via :

(A) Pili

(B) Type IV secretion system

(C) Diffusion

(D) Endocytosis

58. Crown gall formation is due to :

(A) Cytokinin only

(B) GA

(C) Auxin + cytokinin

(D) ABA

59. Transformation efficiency depends on :

(A) Plant species

(B) Explant type

(C) Conditions

(D) All of the above

60. Agrobacterium mainly infects :

(A) Monocots

(B) Dicots

(C) Animal

(D) Fungi

61. Modern techniques allow transformation in :

(A) Only dicots

(B) Animals

(C) Monocots also

(D) Viruses

62. Co-cultivation involves :

(A) Plant + bacteria

(B) Plant only

(C) Bacteria only

(D) Medium

63. Which of the following is commonly used in selection of transformed plant cells ?

(A) Glucose

(B) Antibiotic (e.g., kanamycin)

(C) Auxin

(D) Cytokinin

64. Regeneration in plant transformation refers to :

(A) DNA replication

(B) Development of whole plant from transformed cells

(C) Mutation

(D) Cell death

65. The T-DNA region in a vector carries :

(A) Only vir genes

(B) Structural proteins

(C) Ribosomal RNA

(D) Gene of interest

66. What is the main advantage of the binary vector system ?

(A) No need for bacteria

(B) Easier manipulation and cloning

(C) No T-DNA transfer

(D) No gene expression

67. Opines are synthesized in :

(A) Bacterial cells only

(B) Animal cells

(C) Transformed plant cells

(D) Fungal cells

68. The main function of a selectable marker gene is to :

(A) Identify transformed cells

(B) Express protein

(C) Enhance growth

(D) Prevent mutation

69. Reporter genes are used for :

(A) Selection

(B) Monitoring gene expression

(C) DNA replication

(D) Mutation

70. The GUS reporter assay produces :

(A) Green fluorescence

(B) Blue coloration

(C) Red pigment

(D) No color

71. Stable transformation results in :

(A) Temporary gene expression

(B) Protein degradation

(C) No expression

(D) Permanent integration into genome

72. Transient expression refers to :

(A) Stable integration

(B) Temporary gene expression without integration

(C) DNA replication

(D) Mutation

73. Gene silencing in plants is mainly achieved through :

(A) DNA replication

(B) Protein folding

(C) RNA interference (RNAi)

(D) Translation

74. The leaf disc method involves :

(A) Root transformation

(B) Infection of leaf explants with Agrobacterium

(C) DNA sequencing

(D) Protoplast fusion

75. Ti plasmid originates from :

(A) Virus

(B) Agrobacterium

(C) Plant nucleus

(D) Fungi

76. For expression of a transgene, which is essential ?

(A) Lipid

(B) ATP

(C) Ribosome

(D) Promoter

77. CaMV 35S promoter is known for :

(A) Weak expression

(B) No expression

(C) Tissue-specific expression

(D) Strong constitutive expression

78. The terminator sequence in a vector is required for :

(A) Stopping transcription

(B) Initiating transcription

(C) DNA replication

(D) Mutation

79. Vector backbone mainly contains genes for :

(A) Photosynthesis

(B) Replication and maintenance

(C) Translation

(D) Mutation

80. Selection of transformed cells ensures :

(A) Growth of all cells

(B) Only transformed cells survive

(C) No growth

(D) Mutation

81. Agrobacterium is called a natural genetic engineer because :

(A) It mutates DNA

(B) It produces hormones

(C) It synthesizes proteins

(D) It transfers DNA into plant genome naturally

82. Regeneration of protoplasts requires :

(A) Removal of DNA

(B) Formation of new cell wall

(C) Mutation

(D) Protein degradation

83. CRISPR-Cas9 is used for :

(A) Protein synthesis

(B) Mutation only

(C) Genome editing

(D) Growth

84. Guide RNA in CRISPR directs :

(A) Target DNA sequence

(B) DNA replication

(C) Protein folding

(D) Mutation

85. Cointegrate vector system involves :

(A) One plasmid

(B) Two plasmids

(C) No plasmid

(D) Three plasmids

86. Marker-free technology in plant transformation aims to :

(A) Introduce marker genes

(B) Increase mutation

(C) Remove selectable marker genes

(D) Stop gene expression

87. The Cre-lox system is used for :

(A) DNA replication

(B) Site-specific recombination

(C) Protein synthesis

(D) Mutation

88. A researcher performs Agrobacterium-mediated transformation using a vector lacking border sequences but containing vir genes and gene of interest. No transformants are obtained. What is the most likely reason ?

(A) Vir genes are inactive

(B) T-DNA cannot be recognized for transfer

(C) Promoter is missing

(D) Marker gene absent

89. In a tissue culture experiment, repeated subculturing leads to loss of regeneration ability despite optimal hormone conditions. What is the most likely explanation ?

(A) Hormone imbalance

(B) Loss of totipotency due to epigenetic/genetic changes

(C) Nutrient depletion

(D) Contamination

90. A CRISPR experiment introduces double-strand breaks, but repair leads to no mutation in target gene. Which mechanism explains this ?

(A) Non-homologous end joining (NHEJ) always causes mutation

(B) Guide RNA is absent

(C) Cas9 fails to cut DNA

(D) Homology-directed repair (HDR) restores original sequence

91. A plant transformed via gene gun shows multiple copies of transgene integrated at different loci. Compared to Agrobacterium transformation, this is because :

(A) Gene gun targets specific loci

(B) Integration is mediated by homologous recombination

(C) DNA delivery is random and uncontrolled

(D) Vir genes are absent

92. A cybrid is produced from two species. The resulting plant shows traits from only one parent nucleus but altered mitochondrial traits. What does this indicate ?

(A) Nuclear fusion occurred

(B) Mutation in nuclear DNA

(C) Both genomes integrated equally

(D) Only cytoplasmic exchange occurred

93. A transgene under CaMV 35S promoter is not expressed in roots but expressed in leaves. What is the most plausible explanation ?

(A) Gene silencing in roots

(B) CaMV 35S is tissue-specific

(C) Promoter inactive

(D) DNA not integrated

94. In protoplast fusion, heterokaryons form but fail to regenerate plants. What is the most critical limiting step ?

(A) DNA replication

(B) Light exposure

(C) Hormone addition

(D) Cell wall regeneration and division

95. A researcher observes high mRNA levels of a transgene but no corresponding protein. What is the best explanation ?

(A) Transcription failure

(B) DNA mutation

(C) Post-transcriptional gene silencing

(D) Promoter absence

96. Chloroplast transformation is preferred for certain transgenes because it reduces gene flow. What is the key reason ?

(A) Nuclear genes are dominant

(B) Chloroplasts are maternally inherited

(C) Chloroplast DNA is unstable

(D) No gene expression

97. A selectable marker gene is expressed but transformed cells still die under selection. What is the most likely explanation ?

(A) Marker gene is absent

(B) Promoter driving marker gene is weak or inactive

(C) DNA is not present

(D) Selection agent is weak

98. Somatic embryos resemble :

(A) Roots

(B) Zygotic embryos

(C) Leaves

(D) Callus

99. Protoplasts are fragile because they :

(A) Lack Plasmamembrane

(B) Lack cytoplasm

(C) Lack nucleus

(D) Lack cell wall

100. Bioinformatics is mainly used for :

(A) DNA replication

(B) Data analysis

(C) Mutation

(D) Growth

(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 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।