

**M.Phil./Ph.D. ADMISSION TEST, 2019 & 2020****Paper II****Subject : 104 - BIOTECHNOLOGY**

Roll No. (In figures) .....(In words) .....

OMR Sheet Barcode No. ....

Signatures of Invigilators 1. .... 2. ....

Names of Invigilators 1. .... 2. ....

Time : 2 Hours

Max. Marks : 200

**GENERAL INSTRUCTIONS**

1. Read the instructions given on the Question Booklet and OMR Sheet before starting the answers. All the entries should be filled by **blue or black ball point pen**.
2. The Question Booklet contains **100** questions and all questions are compulsory.
3. Each question is of **2** marks. There is **no negative marking**.
4. Candidates must ensure that the Question Booklet issued to them has all the questions. Defective Question Booklet can be got changed within **10** minutes.

1. प्रश्नों के उत्तर लिखने से पूर्व प्रश्न-पुस्तिका और ओ.एम.आर. शीट पर दिये हुए निर्देश पढ़ें। सभी प्रविष्टियाँ नीले अथवा काले बॉल पॉइन्ट पेन से भरें।
2. प्रश्न-पुस्तिका में **100** प्रश्न हैं और सभी प्रश्न अनिवार्य हैं।
3. प्रत्येक प्रश्न **2** अंक का है। कोई **नकारात्मक अंकन (negative marking)** नहीं होगा।
4. परीक्षार्थी सुनिश्चित कर लें कि उन्हें जो प्रश्न-पुस्तिका दी गई है उसमें सभी प्रश्न अंकित हैं। त्रुटिपूर्ण प्रश्न-पुस्तिका **10** मिनट की अवधि में बदलवाई जा सकती है।

5. In case of any discrepancy between English and Hindi versions of a question, English version will be taken as correct, wherever there are both versions.
6. Select and darken the circle corresponding to the answer [(A) or (B) or (C) or (D)] in OMR sheet.
7. In case more than one circles are darkened in a question, it will not be evaluated.
8. Do not make any stray marks on OMR sheet and do not fold it.
9. Any candidate found removing pages from the Question Booklet may be disqualified and prosecuted.
10. Use of unfair means will disqualify the candidate from the examination.
11. Cell phone, calculator or any such devices are not allowed in the Examination Hall.
12. No candidate is allowed to leave the seat before handing over the original OMR sheet to the invigilator. Candidate can take Question Booklet and Carbon copy of OMR sheet.

5. किसी प्रश्न के अंग्रेजी और हिन्दी रूपान्तरणों में भिन्नता होने की स्थिति में अंग्रेजी रूपान्तरण सही माना जायेगा जहाँ प्रश्न-पत्र दोनों भाषाओं में है।
6. सही उत्तर का चयन करें तथा सम्बन्धित [(A) अथवा (B) अथवा (C) अथवा (D)] गोले को ओ.एम.आर. शीट में काला करें।
7. किसी प्रश्न में एक से अधिक गोले को काला करने पर उसे जाँचा नहीं जायेगा।
8. ओ.एम.आर. शीट पर किसी तरह का चिह्न न बनायें और न ही उसे मोड़ें।
9. प्रश्न-पुस्तिका से पृष्ठ निकालते हुए पाये जाने पर परीक्षार्थी को अयोग्य घोषित किया जा सकता है और उसके विरुद्ध विधिक कार्यवाही भी की जा सकती है।
10. अनुचित साधनों का उपयोग करने पर परीक्षार्थी को परीक्षा के लिए अयोग्य घोषित कर दिया जायेगा।
11. सेलफोन, संगणक और ऐसी किसी भी अन्य प्रविधियों को परीक्षा भवन में लाने की अनुमति नहीं है।
12. ओ.एम.आर. शीट की मूल प्रति वीक्षक को सुपुर्द किये बिना किसी भी परीक्षार्थी को अपना स्थान छोड़ने की अनुमति नहीं है। परीक्षार्थी प्रश्न-पुस्तिका एवं ओ.एम.आर. शीट की कार्बन प्रति को अपने साथ ले जा सकेगा।

1. Genetic markers are \_\_\_\_\_ portions of \_\_\_\_\_ whose inheritance pattern can be followed.
  - (A) Unidentifiable, Genes
  - (B) Unidentifiable, Chromosomes
  - (C) Identifiable, Chromosomes
  - (D) Identifiable, Genes
2. One centimorgan is defined as \_\_\_\_\_ percentage of total recombination events.
  - (A) 01
  - (B) 10
  - (C) 0.1
  - (D) 0.01
3. Major Histocompatibility complex is a tight cluster of linked \_\_\_\_\_.
  - (A) Carbohydrates
  - (B) Genes
  - (C) Proteins
  - (D) Lipid Molecules
4. Hybridomas are made by :
  - (A) Fusing T cells with myeloma cells
  - (B) Fusing B cells with myeloma cells
  - (C) Fusing T helper cells with myeloma cells
  - (D) Fusing B memory cells with myeloma cells
5. Signal splitting in NMR arises from :
  - (A) Shielding effect
  - (B) Spin - Spin decoupling
  - (C) Spin - Spin coupling
  - (D) Deshielding effect
6. How many isoprene units are there in sesquiterpenes ?
  - (A) 1
  - (B) 2
  - (C) 3
  - (D) 8
7. Name the Co-enzyme of Riboflavin.
  - (A) NAD or NADP
  - (B) FAD or FMN
  - (C) Co-enzyme A
  - (D) Thiamine pyrophosphate
8. Which of the following is **not** a type of plasmid ?
  - (A) F
  - (B) R
  - (C) Ti
  - (D) T4

9. The function of  $\beta$  subunit of polymerase is :
  - (A) Template Binding
  - (B) Catalytic Binding
  - (C) Promoter Binding
  - (D) Cation Binding
10. Hybrid dysgenesis is caused by which of the following Transposable element ?
  - (A) Non - composite Transposon
  - (B) LINE
  - (C) P - element
  - (D) AC - element
11. Which property of Co-enzyme Q makes it an ideal electron transporter between the three membrane - bound respiratory chain complexes I, II and III ?
  - (A) its optical spectra
  - (B) its charge
  - (C) its hydrophobicity
  - (D) its hydrophilicity
12. Most foods derived from genetically modified crops contain :
  - (A) The same number of genes as food produced from conventional crops
  - (B) The same number of genes as food produced from hybrid crops
  - (C) One or two additional genes
  - (D) Hundreds of additional genes
13. Double stranded DNA is found in which viruses ?
  - (A) Poxviruses
  - (B) Poliomyelitis
  - (C) Influenza virus
  - (D) Corona virus
14. Which among the following is called filamentous bacteria ?
  - (A) Mycoplasma
  - (B) Spirochaetes
  - (C) Actinomycetes
  - (D) Vibrio
15. Which of the following species is used for producing tetracycline ?
  - (A) *S. Venezuelae*
  - (B) *S. griseus*
  - (C) *S. aureofaciens*
  - (D) *S. griseoflavus*
16. Polymixin inhibits the growth of microbes by carrying out which of the following actions ?
  - (A) Inhibition of cell wall synthesis
  - (B) Damage to cytoplasmic membrane
  - (C) Inhibition of nucleic acid and protein synthesis
  - (D) Inhibition of specific enzyme systems

17. Which of the following functions is **not** performed by transposase ?
- (A) Restriction of the IS element
  - (B) Integration of the transposon
  - (C) Formation of the RNA intermediate
  - (D) Restriction of the host genome
18. The vaccines produced through Recombinant DNA technology are :
- (A) Third generation vaccines
  - (B) First generation vaccines
  - (C) Second generation vaccines
  - (D) None of the above
19. Oncogenes **do not** encode for :
- (A) Transmembrane protein receptors
  - (B) Growth Factors
  - (C) DNA dependent RNA polymerase
  - (D) Cytoplasmic G proteins and protein kinases
20. Which property of P53 enables it to prevent the development of Cancer ?
- (A) It is a transcription factor that causes protein production which stimulates the cell cycle
  - (B) It prevents the replication of cell with damaged DNA
  - (C) It prevents cells from triggering apoptosis
  - (D) It stimulates synthesis of DNA repair enzymes that replace telomere sequence lost during cell division
21. Which of the following is the characteristics of a normal cell ?
- (A) Anchorage independent
  - (B) Continuous cell lines
  - (C) Dependent on external growth factors
  - (D) No contact inhibition
22. The resolution power of TEM is :
- (A) 0.2 nm
  - (B) 0.02 nm
  - (C) 2.0 nm
  - (D) 20 nm
23. The shortest phase of the cell cycle is :
- (A) Prophase
  - (B) Metaphase
  - (C) Anaphase
  - (D) Telophase
24. Which of the following Cyclin - CDK complex initiates degradation of nuclear membrane during cell cycle ?
- (A) Cyclin B - CDK1
  - (B) Cyclin D - CDK4
  - (C) Cyclin E - CDK2
  - (D) Cyclin A - CDK4

25. Which of the following is necessary for the transport of mRNA from the nucleus to the cytoplasm ?
- (A) Splicing
  - (B) 5' capping
  - (C) NLS sequence
  - (D) Secondary structure
26. The RNA polymerase enzyme of *E. Coli* consists of \_\_\_\_\_ different subunits.
- (A) 4
  - (B) 5
  - (C) 6
  - (D) 8
27. Which of the following is a component of MAP Kinase signal transduction pathway ?
- (A) IP3
  - (B) ERK
  - (C) Protein Kinase 13
  - (D) JAK Kinase
28. Which of the following proteins is involved in apoptosis ?
- (A) Caspase
  - (B) Cyl2
  - (C) BX1
  - (D) All of the above
29. Which of the following is a cytoskeletal protein ?
- (A) Glycophorin A
  - (B) Glycophorin B
  - (C) Spectrin
  - (D) Band 3 protein
30. A messenger RNA is 336 bases long including initiation and termination codon the number of amino acids in the polypeptide translated from this is :
- (A) 110
  - (B) 333
  - (C) 111
  - (D) 600
31. In mismatch repair mechanism which protein recognises DNA mismatches in genomic DNA ?
- (A) Mut H
  - (B) Mut S
  - (C) Mut L
  - (D)  $U_{rr}$  D
32. Splicing consensus sequence is :
- (A) Exon/GU - Intron - AG/Exon
  - (B) Exon/UG - Intron - AT/Exon
  - (C) Exon/GU - Intron - GA/Exon
  - (D) Exon/AU - Intron - CG/Exon

33. Embryonic stem cells are derived from the \_\_\_\_\_ of the blastocyst.
- (A) Inner cell mass
  - (B) Ectoderm
  - (C) Blastocoel
  - (D) Mesoderm
34. Fibrous protein such as silk fibroin consist of polypeptide chains arranged in :
- (A)  $\alpha$  - helix
  - (B)  $\beta$  - helix
  - (C)  $\beta$  - pleated sheet
  - (D) None of the above
35. Bird feathers, fish scales, cattle horns, hoofs are made up of :
- (A) Fatty acid
  - (B) Lignified tissue
  - (C) Keratin
  - (D) Cellulose
36. The type of Chromatography which is used for separating volatile compounds :
- (A) HPLC
  - (B) Gas Chromatography
  - (C) Paper Chromatography
  - (D) Ion Exchange Chromatography
37. Cholesterol is the precursor of :
- (A) Progestrins
  - (B) Corticoids
  - (C) Both
  - (D) None of the above
38. Rancidity in fat occurs due to :
- (A) Oxidation
  - (B) Hydrolysis
  - (C) Reduction
  - (D) Bacterial growth
39. Malonic acid and Malonate may also act as :
- (A) Promoter
  - (B) Reversible inhibitor
  - (C) Irreversible Inhibitor
  - (D) All of these
40. Causal organism of Rocky Mountain Spotted Fever :
- (A) *Rickettsia rickettsii*
  - (B) *Borrelia burgdorferi*
  - (C) *Coxiella burnetii*
  - (D) *Chlamydia psittaci*

41. Which of the following is **not** a bacteria ?
- (A) *Enterococcus*
  - (B) *Erwinia*
  - (C) *Escherichia*
  - (D) *Monilia*
42. Organisms that grow well at or below 7°C are called :
- (A) Mesophiles
  - (B) Thermophiles
  - (C) Psychrophiles
  - (D) None
43. According to first law of thermodynamics, energy of an isolated system remains :
- (A) Variable
  - (B) Constant
  - (C) Zero
  - (D) One
44. The structure present in Cyanobacteria (BGA) helping in N<sub>2</sub> fixation is :
- (A) Haploperm
  - (B) Holostrum
  - (C) Holotrema
  - (D) Heterocyst
45. Streptomycin is obtained from :
- (A) *Streptomyces griseus*
  - (B) *Streptomyces aureofaciens*
  - (C) *Streptomyces Venezuelae*
  - (D) *Streptomyces ramosus*
46. Polymerase chain reaction was discovered by :
- (A) Robert Holley
  - (B) Karry Mullis
  - (C) Har Gobind Khorana
  - (D) D. Nathans
47. Which of the following was used for isolation of nif genes ?
- (A) *Klebsiella*
  - (B) *E. Coli*
  - (C) *Yeast*
  - (D) *Streptomyces*
48. DNA probes can be used in medicine for the purpose of :
- (A) Vaccine production
  - (B) Diagnosis
  - (C) Drug development
  - (D) Gene therapy



49. Fixed nitrogen is released back to the atmosphere by :
- (A) Symbiotic associations
  - (B) Plants
  - (C) Denitrifying bacteria
  - (D) None
50. Which of the following is an example of sex linked disease ?
- (A) AIDS
  - (B) Colour blindness
  - (C) Syphilis
  - (D) Gonorrhoea
51. During transcription, the DNA site at which RNA polymerase binds is called :
- (A) promoter
  - (B) regulator
  - (C) receptor
  - (D) enhancer
52. Christmas disease is another name for :
- (A) Haemophilia B
  - (B) Hepatitis B
  - (C) Down's syndrome
  - (D) Sleeping sickness
53. After a mutation at a genetic locus the character of an organism changes due to change in :
- (A) Protein structure
  - (B) DNA replication
  - (C) Protein synthesis pattern
  - (D) RNA transcription pattern
54. Which of the following is generally used for induced mutagenesis in crop plants ?
- (A) X-rays
  - (B) UV-rays (260 nm)
  - (C) gamma rays (from cobalt 60)
  - (D) alpha particles
55. AIDS is caused by HIV that principally infects :
- (A) All lymphocytes
  - (B) Activator B cells
  - (C) Cytotoxic T cells
  - (D) T4 lymphocytes
56. Which of the following is an example of protozoan disease ?
- (A) Malaria
  - (B) Leishmaniosis
  - (C) Amoebiasis
  - (D) All of the above

57. The value of variable with highest frequency is :
- (A) Mode
  - (B) Median
  - (C) Mean Deviation
  - (D) None of the above
58. Water borne disease is :
- (A) Dysentery
  - (B) Typhoid
  - (C) Meningitis
  - (D) All of the above
59. Which one of the following is fungal pathogen ?
- (A) *Candida*
  - (B) *Cryptococcus*
  - (C) *Trichophyton*
  - (D) All of the above
60. Construction of cDNA library makes use of :
- (A) RNA polymerase
  - (B) Klenow fragment
  - (C) Reverse transcriptase
  - (D) Colony hybridization
61. Transposons **can not** be used as :
- (A) mutagens
  - (B) genetic markers
  - (C) vectors
  - (D) sex factor
62. Which of the following is a hybridization based marker system ?
- (A) RFLP
  - (B) RAPD
  - (C) SSR
  - (D) AFLP
63. Which of the following is a mycotoxin ?
- (A) Aflatoxin
  - (B) Citrinin
  - (C) Ochratoxins
  - (D) All
64. Microscope which is used to study living cell :
- (A) Electron Microscope
  - (B) Phase contrast microscope
  - (C) Fluorescence Microscope
  - (D) Compound Microscope
65. Which one of the following is acid - fast bacteria of medical importance ?
- (A) *Mycobacterium leprae*
  - (B) *Mycobacterium tuberculosis*
  - (C) *Mycobacterium avium*
  - (D) All

66. Which of the following groups consists of only input devices ?  
 (A) Mouse, Keyboard, Scanner  
 (B) Mouse, Keyboard, Plotter  
 (C) Mouse, Keyboard, Printer  
 (D) Mouse, Keyboard, Monitor
67. Which one of the traits is **not** desirable in an ideal Reporter Gene ?  
 (A) Detection with high sensitivity  
 (B) High endogenous activity in plant to be transformed  
 (C) There should be a quantitative assay to detect it  
 (D) Preferably it should have a non - destructive assay
68. Male sterility can be genetically engineered in plants by expressing bacterial gene encoding :  
 (A) Cry  
 (B) barnase  
 (C) GUS  
 (D) rol B
69. Seeds that cannot tolerate dehydration and therefore **cannot** be stored in seed banks for longer periods are known as :  
 (A) Orthodox seeds  
 (B) Recalcitrant seeds  
 (C) synthetic seeds  
 (D) Albuminous seeds
70. Which one of the following enzymes was used by E.C. Cocking (1960) to isolate plant protoplasts ?  
 (A) Cellulase  
 (B) Pectinase  
 (C) Pectolyase  
 (D) Hemicellulases
71. Research centre of consultative group on International Agricultural research (CGIAR) in India is situated at :  
 (A) IARI, New Delhi  
 (B) ICRISAT, Hyderabad  
 (C) ICAR, Bengaluru  
 (D) CAZRI, Jodhpur
72. Which one of the following microbe is **not** involved in biodegradation of Xenobiotics ?  
 (A) *Bacillus subtilis*  
 (B) *Pseudomonas putida*  
 (C) *Escherichia coli*  
 (D) *Zygomonas mobilis*
73. Which one of the pairs is **not** correctly matched ?  
 (A) Green house gas : Methane  
 (B) Xenobiotic compound : Pesticides  
 (C) Integrated pest management : Sustainable agriculture  
 (D) Acid rain : Acetic acid

74. Methods used for treating sludges to convert into organic fertilizer are :

- (A) Anaerobic digestion and ultraviolet light treatment
- (B) Composting and Pasteurization
- (C) Incineration and Pasteurization
- (D) Ozonation and composting

75. Molecular markers are **not** employed for which one of the following ?

- (A) To study phylogeny and evolution
- (B) For diversity analysis
- (C) For Genotyping
- (D) In fermentation technology

76. Consider the following statements :

- (i) Under natural conditions, bacteria use restriction endonucleases to cleave foreign DNA.
- (ii) Infecting bacterial viruses have developed systems that protect their own DNA from being degraded.
- (iii) Mostly, methylation of the Guanine residues of a restriction endonuclease site in the host DNA prevents restriction endonucleases from cutting at these sites.

Which of the statements given above is/are correct ?

- (A) (i) only
- (B) (i) and (ii)
- (C) (i), (ii) and (iii)
- (D) (ii) and (iii)

77. With reference to somatic embryogenesis consider the following statements :

- (i) Somatic embryo is a bipolar structure with a closed radicular end.
- (ii) Somatic embryo has no vascular connection with the mother tissue.
- (iii) Somatic embryos are produced directly from the mother tissue only.
- (iv) Somatic embryos are induced only on Murashige and Skoog medium.

Identify the **incorrect** statements from above :

- (A) (i) and (ii)
- (B) (ii) and (iii)
- (C) (iii) and (iv)
- (D) (i) and (iv)

78. Precautions, control measures and appropriate facilities required to minimise the risk of laboratory acquired infections with Corona Virus 2 (SARS - CoV - 2) should be of which Biosafety level ?

- (A) BSL - 1
- (B) BSL - 2
- (C) BSL - 3
- (D) BSL - 4

79. Induction of hairy roots upon infection by *Agrobacterium rhizogenes* in plants is often done to produce :

- (A) Secondary metabolites
- (B) Plant growth hormones
- (C) Biofertilizers
- (D) Inducers

80. Chloroplast transformation has become an important technique in plant biotechnology because :
- Due to large transgene copy number obtained there is very high level of transgene expression.
  - Due to low transgene copy number there is absence of gene silencing.
  - A large percentage of somaclonal variations can be obtained.
  - It is easy to do and cost effective also.
81. For food preservation which one of the following falls under Class - I preservative category ?
- Citric acid and Vinegar
  - Benzoic acid and sulphites
  - Nitrates and sulphur dioxides
  - Sugar and nitrites
82. One of the popular fermented and steamed food product is :
- Jalebi
  - Sauerkraut
  - Idli
  - Cheese
83. A culture system where the growth of a bacterial population can be maintained in a steady state over a long period of time is called :
- Batch culture
  - Fed - batch culture
  - Continuous culture
  - Suspension culture
84. Which one of the following plant tissue culture technique will be most suitable for mass multiplication of true to type plants ?
- Haploid production
  - Somatic hybridization
  - Cybrid production
  - Micropropagation
85. A technique most oftenly used to create interspecific and intergeneric crosses that would normally produce seeds which are aborted :
- Apomixis
  - Embryo rescue
  - Somatic embryogenesis
  - Genetic transformation
86. One of the following is employed in the biological method for disrupting microbial cells to obtain final product after fermentation :
- Lysozyme
  - Alkali
  - Organic solvent
  - Detergent
87. The molecular marker which can easily distinguish individuals having different sequences in their DNA at a particular region are said to be :
- Monomorphic
  - Dimorphic
  - Polymorphic
  - Isomorphic

88. Discovery of which one of the following became a biological remedy for removing oil pollution caused by disastrous oil spill and leakages in marine ecosystems ?
- (A) Flavr Savr
  - (B) Superbug
  - (C) Super weeds
  - (D) Ti plasmids
89. Which one of the statements is TRUE about Green fluorescent protein ?
- (A) The genes of this protein are isolated from bacteria.
  - (B) It fluoresces green when it is exposed to ultraviolet light.
  - (C) It requires saline conditions and a particular pH range to produce fluorescence.
  - (D) It is phototoxic to intact living cells.
90. The genes of which one of the following are situated on the Ti plasmid but are not part of the T-DNA region ?
- (A) Auxins
  - (B) Cytokinins
  - (C) Opines
  - (D) Opine catabolism
91. Gene gun utilized to bombard the plant cell wall with many DNA coated metal particles uses which one of the following gases as propellant ?
- (A) Helium
  - (B) Hydrogen
  - (C) Nitrogen
  - (D) Oxygen
92. Which one of the following does **not** protect plants against insects ?
- (A) 5-enolpyruvylshikimate-3-phosphate synthase (EPSPS)
  - (B) Protease inhibitors
  - (C)  $\alpha$  - Amylase inhibitor
  - (D) cry genes
93. Which organization is financially supporting patent filing in India ?
- (A) Department of Science and Technology
  - (B) University Grants Commission
  - (C) Department of Labour
  - (D) Indian Institute of Science Education and Research

94. Which committee in the Ministry of Environment and Forests grants approval, monitor and evaluate research activities involving recombinant DNA technology ?
- Institutional Biosafety Committee
  - Review Committee on Genetic manipulation
  - Genetic Engineering Approval Committee
  - District level Committees
95. Which one of the following media is used as both a selective and differential media ?
- Nutrient Agar
  - Mannitol Salt Agar
  - Potato dextrose Agar
  - Cane molasses
96. Which one of the method is useful for preventing damage due to ice-crystal formation during cryopreservation ?
- Vitrification
  - Dehydration
  - Thermotherapy
  - Leaching
97. Electroporation facilitates introduction of foreign DNA into the target cell/tissue by :
- Irreversible damage of cell membrane
  - Lysis of the cell wall
  - Active transport across the cell wall
  - Increase in cell membrane permeability
98. During the second wave of COVID, the river Ganga in Varanasi seems to have changed its colour to dark green, the main reason is :
- Excessive growth of *Microcystis* algae
  - Excessive growth of Bacteria
  - Increased number of fishes
  - Less disturbance of water due to lockdown
99. To achieve fast, inexpensive, safe and large scale production of therapeutic proteins with non-cumbersome storage issues which expression system will be most suitable ?
- Mammalian cell lines
  - Bacteria
  - Insect cells
  - Plants
100. During which step of sewage treatment the bacteria and protozoa are used to consume biodegradable soluble organic contaminants ?
- Primary treatment
  - Secondary treatment
  - Tertiary treatment
  - Fourth treatment stage

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SEAL