Question Booklet Sr. No.

1002

Roll No. .....

OMR Sheet No. .....

Ph.D.–2003

BIO-TECHNOLOGY ENTRANCE TEST, MARCH 2020

Time : 2 Hours

Maximum Marks : **200**

Number of Pages in this Booklet : **20**

Number of Questions in this Booklet : **100**

INSTRUCTIONS FOR THE CANDIDATES

(i) Check this booklet carefully for the sequence of pages and questions. If it is defective due to pages/questions missing or not in serial order or any other discrepancy it should be got replaced immediately from the invigilator within the period of 5 minutes. Afterwards neither the Question Booklet will be replaced nor any extra time will be given.

(ii) After this verification write your Roll No. and OMR Sheet Number on this Question Booklet.

(iii) **Use only Black or Blue ball point pen.**

(iv) This paper consists of **100** multiple choice type questions. Each question has four alternative answers (a), (b), (c) and (d). **Only one of these alternative answer is correct**. You are required to darken completely the circle of correct answer in the OMR Sheet.

(v) There is **no negative marking.**

(vi) Do not write anything other than relevant entries or put any mark on any part of the OMR Sheet, which may disclose your identity, otherwise you will render yourself liable to disqualification.

(vii) Use of electronic gadgets such as pager, cell phone, calculator and log table etc. is prohibited.

(viii) Rough Work may be done in the end of this booklet.

(ix) You have to **return the OMR Sheet** to the invigilator at the end of the examination compulsorily.

SEAL

I–Research Methodology

1. Fluorescence microscopy is based on the ability of certain molecules :
   (a) Continuously emit light of a constant wavelength
   (b) Absorb light of many different wavelengths
   (c) Absorb light of a given wavelength and then emit light of a longer wavelength
   (d) Absorb light of a given wavelength and then emit light of a shorter wavelength

2. Proteins give fluorescence because of the presence of :
   (a) Tyrosine (b) Phenylalanine
   (c) Tryptophan (d) All of these

3. Fourier transform is used in NMR. What is its importance?
   (a) Convert electronic transition into signal
   (b) Convert time domain free induction decay pattern to frequency
   (c) Used to calculate chemical shift
   (d) Used to calculate spin-spin splitting

4. Electrophoretic procedure which does not depend on the charge of a protein is :
   (a) Moving boundary electrophoresis (b) Isoelectric focussing
   (c) SDS-PAGE (d) All of these

5. The PI (isoelectric point) of a protein is 6. At pH 7, when electric field is applied, the protein :
   (a) Moves towards anode (b) Moves towards cathode
   (c) Does not move (d) Moves randomly

6. Antibodies are separated by the :
   (a) Isopyenic centrifugation (b) Differential centrifugation
   (c) Zonal centrifugation (d) None of these

7. Cell disruption of microbial cells can be carried out by :

(a) Sucrose gradient centrifugation
(b) Ultrafiltration
(c) Sonication
(d) Ultracentrifugation

8. DNA binding protein can be detected by :

(a) Western blotting
(b) Eastern blotting
(c) Northern blotting
(d) South-Western blotting

9. Which of the following technique is used to study protein-protein interaction?

(a) CHIP assay
(b) Yeast one hybrid system
(c) Yeast two hybrid system
(d) All of these

10. Ethidium bromide is used to visualize nucleic acid because :

(a) It makes covalent bond with nucleic acid and fluorescences at 302 nm
(b) It stacks between bases
(c) Ethidium bromide gives fluorescence which is detected by UV-illuminator
(d) Ethidium bromide-nucleic acid complex increase the fluorescence of the ethidium bromide

11. The molecular weight of an unknown protein can be best determined by :

(a) Ion-exchange chromatography
(b) Centrifugation
(c) Mass spectroscopy
(d) Affinity chromatography

12. On the completion of isoelectric focussing the net charge on a protein is :

(a) Positive
(b) Negative
(c) Zero
(d) Intermediate

13. TEM can be used for the study of :

(a) Topology of bacteria

(b) Internal structure of bacteria

(c) For both topology and internal structure of bacteria

(d) None of these

14. The instrument used to draw clear magnified sketches of objectives under microscope is :

(a) Compound microscope (b) Light microscope

(c) Camera Lucida (d) Camera attached stereomicroscope

15. When the power of ocular lens is 10X and objective lens is 20X, the magnification is :

(a) 30 times (b) 20 times

(c) 200 times (d) 2000 times

16. Which of the following is a desired characteristic of the organism to be used for industrial applications?

(a) Should produce high amount of product

(b) Should grow rapidly

(c) Should be readily available

(d) All of these

17. Which of the following algae is used for the production of single cell proteins?

(a) *Spirullina* (b) *Caulerpa*

(c) *Anabaena* (d) *Ascophyllum*

18. Which of the following is downstream processing?

(a) Product recovery (b) Screening

(c) Medium formulation (d) Sterilization of medium

19. What are GLPs?

(a) Good manufacturing practices
(b) A quality assurance system
(c) Both (a) and (b)
(d) None of these

20. A network of computer and other devices that is confined to a relatively small space is called :

(a) Wide area network
(b) Local area network
(c) Global network
(d) Peer to peer network

21. Every computer connected to internet is identified by a unique four-part string, known as :

(a) IP address
(b) Host name
(c) Domain name
(d) None of these

22. Which of the following sector/sectors comes under intellectual property rights?

(a) Patents
(b) Trademarks
(c) Copyright
(d) All of these

23. Ni-column is used for the purification of :

(a) His tag protein
(b) GST tag protein
(c) Negatively charged protein
(d) Carbohydrates

24. Concentration of cytokine secreting cell can be measured by :

(a) RIA
(b) ELISA
(c) Eli-spot
(d) All of these

25. Which of the following fluorescent probe is used to monitor the progresss of amplification in Real time PCR?

(a) Rhodamine
(b) FITC
(c) Cyan blue
(d) SYBR green

26. A particular cell type of a heterogenous mixture of cell types can be isolated by :

(a) Antibody affinity chromatography

(b) Density gradient centrifugation

(c) Differential centrifugation

(d) High performance liquid chromatography

27. The unique feature of the enzyme Taq polymerase used in PCR is :

(a) High speed (b) High fidelity

(c) High thermal stability (d) Low thermal stability

28. Antigen interaction with antibody is measured by :

(a) ELISA (b) RIA

(c) Immunodiffusion (d) All of these

29. Reverse phase chromatography is known for its :

(a) Separation of non-polar molecules (b) Use of non-polar mobile phase

(c) Use of polar mobile phase (d) None of these

30. Distance between active site and allosteric site is determined by :

(a) CD (b) COSY

(c) FRET (d) NMR

31. A column packed with sieve particles is used in which of the following technique to separate smaller and larger protein molecules :

(a) Affinity chromatography

(b) Gel electrophoresis

(c) Molecular exclusion chromatography

(d) All of these

32. Isoelectric focussing technique used to separate proteins works on the principle of :

(a) Electrophoretic separation based on relative content of acidic and basic residues

(b) Mass of protein molecules

(c) Number of amino acids containing sulphur

(d) Coagulation capacity of protein molecules

33. Maxam Gilbert and Sanger dideoxy methods are concerned with :

(a) DNA amplification (b) DNA damage

(c) DNA repair (d) DNA sequencing

34. In autoradiography :

(a) β-particles are used to expose silver halide grains of film

(b) α-particles are used to expose silver halide grains of films

(c) Both (a) and (b)

(d) None of these.

35. Sucrose gradient centrifugation can be used to estimate the size of :

(a) Proteins (b) RNA molecules

(c) Ribosomes (d) Ribosomal subunits

36. Aeration in a bioreactor is provided by :

(a) Impeller (b) Baffles

(c) Sparger (d) All of these

37. The selection of an appropriate purification method in the product recovery after microbial fermentation depends upon :

(a) Nature and stability of the end product produced

(b) Type of the side products present

(c) Degree of purification required

(d) All of these.

38. For scaling up of a bioprocess which of the following parameter is assumed to be constant?

(a) Air flow rate

(b) Diameter of the impeller

(c) Agitation speed

(d) Volumetric mass transfer coefficient

39. The net growth rate becomes zero during :

(a) Lag phase (b) Log phase

(c) Stationary phase (d) Death phase

40. Soild state fermentation is best suited for :

(a) Filamentous fungi (b) Yeast

(c) Bacteria (d) All of these

41. Del factor is represented by :

(a) $\ln N_t / N_o$ (b) $\ln N_o / N_t$

(c) $\ln N_o \times N_t$ (d) $\ln N_o / N_o$

42. In large scale fermentation, the preferred method for sterilization is :

(a) Chemical (b) Radiation

(c) Filteration (d) Heat

43. Phylogeny describes a species :

(a) Morphological similarities with other species

(b) Reproductive compatibilities with other species

(c) Evolutionary history

(d) Geographical distributions

44. A plant with smallest genome is :

(a) *Pisum*
(b) *Nicotiana*
(c) Rice
(d) *Arabidopsis*

45. An example of homology and similarity tool is

(a) PROSPECT
(b) EMBOSS
(c) RasMol
(d) BLAST

46. The first bioinformatics database was created by :

(a) Richard Durbin
(b) Dayhoff
(c) Michael J. Down
(d) Pearson

47. The regression coefficient is independent of the change of :

(a) Scale only
(b) Origin only
(c) Both scale and origin
(d) Neither scale or origin

48. When an organism is modified using gene technology, the organism is then referred to as :

(a) Generally modified organism
(b) Very modified organism
(c) Genetically modified organism
(d) Gently modified organism

49. The p-value of a test is the :

(a) Smallest significance level at which the null hypothesis cannot be rejected
(b) Largest significance level at which the null hypothesis cannot be rejected
(c) Smallest significance level at which the null hypothesis can be rejected
(d) Largest significance level at which the null hypothesis can be rejected

50. What does a trademark protect ?

(a) An invention
(b) A work of art
(c) Logos, names and brands
(d) The look, shape and feel of a product.

51. Which one of the following is an example of a conjugated protein?

(a) Casein
(b) Albumin
(c) Globulin
(d) Globin

52. Nucleic acids have multiple negative charge due to :

(a) Sugars
(b) Phosphoryl groups
(c) Associated protein
(d) Purine & Pyrimidines

53. Cholestrol is the precursor of :

(a) Progesterone
(b) Testosterone
(c) Estradiol & Cortisol
(d) None of these

54. Who discovered the penicillin?

(a) Robert Koch
(b) Alexander Fleming
(c) Louis Pasteur
(d) A.V. Leeuwenhoek

55. How many bacteria are produced in four hours, if a bacterium divides once in half an hour?

(a) 8
(b) 64
(c) 128
(d) 256

56. The protein coat of virus is called :

(a) Capsomeres
(b) Prions
(c) Viriod
(d) Capsid

57. Akt2 belongs to :

(a) Hedgehog signalling
(b) Insulin receptor signalling
(c) Hippo signalling
(d) NF-kB signalling

58. Balbiani rings are sites of :

(a) DNA replication
(b) RNA and protein synthesis
(c) Synthesis of lipids
(d) Synthesis of polysaccharides

59. The enzyme that breaks H_2 bonds in DNA is :

(a) Helicase
(b) Topoisomerase
(c) Ligase
(d) Polymerase

60. Which of the radioisotope of iodine is generally used in autoradiography technique?

(a) ^{127}I
(b) ^{125}I
(c) ^{126}I
(d) ^{114}I

61. Number of subunits of protein is determined by :

(a) SDS-PAGE
(b) Native PAGE
(c) Reducing SDS-PAGE
(d) Gel filtration

62. Hydrophobic interaction chromatography has a characteristic step :

(a) Uses hydrophobic solvent for binding
(b) Uses hydrophilic solvent for binding
(c) Uses hydrophilic solvent for elution
(d) All of these

63. Cloning vectors with the transcription and translation signals are called :

(a) Plasmid vector
(b) Expression vector
(c) pBR322
(d) pUC

64. Regulated unit of genetic engineering is :

(a) Operator gene (b) Promoter gene

(c) Regulator gene (d) Operon

65. Site directed mutagenesis is also known as :

(a) Mononucleotide directed mutagenesis

(b) Polynucleotide directed mutagenesis

(c) Dinuleotide directed mutagenesis

(d) Oligonucleotide directed mutagenesis

66. Which of the following has been produced commercially from mammalian culture?

(a) Plasminogen activator (b) Antibacterial antibody

(c) Insulin (d) Rennin

67. Which of the following mice are used for immunization in the Hybridoma technology?

(a) Swiss mice (b) Balb/c mice

(c) Out bred mice (d) Indigenous mice

68. In the term "He La Cell Lines", He La stands for :

(a) The tissue of origin (b) The patient name and type of cancer

(c) Type of cancer (d) Patient name.

69. The most widely used chemical for protoplast fusion, as fusogen is :

(a) Manitol (b) Polyethylene glycol (PEG)

(c) Sorbitol (d) Glycerol

70. Variations observed during tissue culture of some plants are known as :

(a) Clonal variations
(b) Somatic variations
(c) Somaclonal variations
(d) Tissue culture

71. Plants developed *in-vitro* culture from pollen grains are :

(a) Androgenic haploids
(b) Pollen plants
(c) Male plants
(d) Sterile plants

72. Which among the following is not a sequence data bank?

(a) GenBank
(b) DNA data bank of Japan
(c) SWISS-PROT
(d) Protein data bank

73. FASTA program was first described by :

(a) Lipmann and Pearson
(b) Adachi and Hasegawa
(c) Fitch and Margoliash
(d) Kyte and Dolittle

74. BLAST and FASTA are used for :

(a) Global similarity
(b) End free space alignment
(c) Local similarity
(d) Gap penalty

75. Who coined the term "Zymase" for enzymes in yeast :

(a) Kuhne
(b) Summer
(c) Louis Pasteur
(d) Edward Buchner

76. Non-protein part of an enzyme is known as :

(a) Holoenzyme
(b) Apoenzyme
(c) Coenzyme
(d) Isoenzyme

77. Enzymes which are slightly different in molecular structure, but can be perform identical activity are called :

(a) Isoenzymes
(b) Holoenzymes
(c) Apoenzymes
(d) Coenzymes

78. Plant secondary metabolites :

(a) Help to increase the growth rate of plant
(b) Help in plant reproduction processes
(c) Provide defence mechanisms against microbial attack
(d) Make the plant susceptible to unfavourable conditions.

79. Which of the following methods of plant transformation can be used to introduce a gene into chloroplast genome?

(a) Agrobacterium-mediated transformation
(b) Particle delivery system
(c) Permeabilization
(d) Electroporation.

80. Hormone which controls cell division and cell differentiation is :

(a) ABA
(b) Auxin
(c) Gibberllin
(d) Cytokinin

81. The process by which DNA of nucleus passage genetic information to mRNA :

(a) Translocation
(b) Transcription
(c) Translation
(d) Transporation

82. Which of these is a base analogue?

(a) Nitrous acid
(b) Colchicine
(c) 5-Bromouracil
(d) Caffeine

83. How many nucleosomes are found in helical coil of 30 nm chromatin fiber :

(a) 10
(b) 12
(c) 06
(d) 09

84. The immunity which shows delayed type of hypersensitivity is :

(a) Cell mediated immunity
(b) Humoral immunity
(c) Antibody immunity
(d) ADCC

85. Immunoglobulin which is expressed on B1 cell is :

(a) IgG
(b) IgA
(c) IgM
(d) IgD

86. The humoral immune response is the aspect of immunity that is mediated by :

(a) Antibodies
(b) Antigen
(c) Dendritic cells
(d) Macrophages

87. Hybridoma technology is used to produce :

(a) Monoclonal antibody
(b) Polyclonal antibody
(c) Both (a) and (b)
(d) B-cells

88. Which of these would not be used to introduce DNA in animal cells?

(a) Liposomes
(b) Electroporation
(c) Microinjection
(d) Ti-plasmid

89. The product commercially produced by animal cell culture is :

(a) Insulin
(b) Tissue plasminogen activator
(c) Interferon
(d) Hepatitis-B vaccine

90. Ethanol concentration is lowest in :

(a) Wine
(b) Beer
(c) Brandy
(d) Rum

91. Which of the following organism is used for commercial production of citric acid?

(a) *Penicillium chrysogenum*
(b) *Pseudomonas aeruginosa*
(c) *Aspergillus niger*
(d) *Xanthomonas campestris*

92. Bacteria commonly used for the production of alcohol is :

(a) *E. coli*
(b) *Zymomonas*
(c) *Pseudomonas*
(d) All of these

93. Stem cells are :

(a) Cells from stem of plants
(b) Cells in bone marrow
(c) M-cells of intestinal epithelium
(d) Dendrites

94. In ELISA test result is determined by measuring :

(a) Intensity of the colour
(b) Intensity of radioactivity
(c) Change in chemilumiscence
(d) Diameter of precipitin ring

95. Intellectual property rights of inventions are protected by :

(a) Copyright
(b) Design
(c) Patent
(d) All of these

96. Which type of genomics, studies the physical nature of genomes?

(a) Comparative genomics
(b) Structural genomics
(c) Functional genomics
(d) None of these

97. Proteomics is :

(a) A branch of quantum physics
(b) A study of algal genome
(c) The study of entire collection of proteins expressed by an organism
(d) None of these

98. Which one of the following is a National agency for regulations of food products in India?

(a) IFFCO
(b) FSSAI
(c) USDA
(d) USFDA

99. Bioremediation can clean up polluted soils by :

(a) Adding nutrients to stimulate the activity of certain soil bacteria.
(b) Inoculating the soil with certain bacteria that can degrade toxic organic compounds.
(c) Using plants to stimulate soil microbial activity by exuding energy compounds in the rhizosphere
(d) All of these

100. The first successful use of gene therapy was in :

(a) Genetic diseases
(b) Cancer
(c) Endocrine disorders
(d) Cardiovascular disease

ROUGH WORK

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SEAL