

(DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU  
ARE ASKED TO DO SO)

**A**

**SET-Y**

**PHD/URS-EE-DEC-2022**

**SUBJECT : Bio-Tech. Engineering**

**10045**

Sr. No. ....

Time : 1¼ Hours

Max. Marks : 100

Total Questions : 100

Roll No. (in figures) \_\_\_\_\_ (in words) \_\_\_\_\_

Name \_\_\_\_\_ Date of Birth \_\_\_\_\_

Father's Name \_\_\_\_\_ Mother's Name \_\_\_\_\_

Date of Examination \_\_\_\_\_

\_\_\_\_\_  
(Signature of the Candidate)

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(Signature of the Invigilator)

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**PHD/URS-EE-2022/(Bio-Tech. Engg.)(SET-Y)/(A)**

SEAL

1. During EMP pathway, the ATP is produced through :
  - (1) Oxidative phosphorylation
  - (2) Cyclic phosphorylation
  - (3) Substrate level phosphorylation
  - (4) None of the above
  
2.  $C_4$  plants are similar to  $C_3$  plants in having :
  - (1) Kranz anatomy
  - (2)  $C_3$  pathway of  $CO_2$  fixation
  - (3) Dimorphic chloroplasts
  - (4) High  $CO_2$  compensation point
  
3. Enzymes concerned with ammonia assimilation is :

(1) Nitrogenase	(2) Arginase
(3) Urease	(4) Glutamine synthetase
  
4. Under water stress conditions which of the following does not increase in leaves ?

(1) Betaine	(2) ABA
(3) Proline	(4) Nitrate reductase
  
5. RFLP study is a technique for :
  - (1) Transferring genes from unrelated species
  - (2) Isolating a single gene
  - (3) Isolating single gene product
  - (4) Identifying genetic (DNA) homologies

6. Genetically engineered male sterile crop plants have been produced by involving :
- (1) Opaque 2 gene
  - (2) Virus coat protein genes
  - (3) Barnase gene
  - (4) Chitinase gene
7. The essential component of Ti Plasmid required for transfer and integration of T DNA into the plant genome is :
- (1) Origin of replication
  - (2) Virulence genes
  - (3) Nopaline utilization gene
  - (4) All of the above
8. Artificial seeds are produced by :
- (1) Immobilization of somatic embryos
  - (2) Biotransformation
  - (3) Biosynthesis
  - (4) Enzymatic isolation
9. Which cell line is used to produce recombinant sex hormones ?
- (1) HELA cell line
  - (2) VERO cell line
  - (3) CHO cell line
  - (4) BHK cell line
10. The technique used in animal biotechnology for the rapid multiplication and production of animals with a desirable genotype is :
- (1) Protoplast Fusion and Embryo Transfer
  - (2) Hybrid Selection and Embryo Transfer
  - (3) In Vitro Fertilization and Embryo Transfer
  - (4) All of the above

11. Animal cell cultures are used widely for the production of :
- (1) Insulin (2) Somatostatin  
(3) MABS (4) Thyroxine
12. The virus commonly used to infect cell cultures for the production of interferon is :
- (1) Corona virus (2) Sendai virus  
(3) Polio virus (4) Smallpox virus
13. Which of the following is the structural fiber in a cell cultural system ?
- (1) Collagen (2) Elastin  
(3) Fibronectin (4) Both (1) and (2)
14. Which of the following media is used for the maturation of oocytes ?
- (1) DMEM (2) TCM-199  
(3) Ham's F-10 (4) Both (2) and (3)
15. In ICSI the sperm is injected in :
- (1) Nucleoplasm (2) Cytoplasm  
(3) Perivitelline space (4) None
16. The HAT medium used for the selection of fused hybrid cells in hybridoma culture was introduced by :
- (1) Littlefield and Miller (2) Kohler and Milstein  
(3) Frish and Jentoft (4) Eagle and Karle



17. Match the Columns :

Column-I	Column-II
(A) Rosic	(i) a-I antitrypsin
(B) ROP	(ii) Protein-enriched milk
(C) Emphysema	(iii) Test to detect antigen or antibody
(D) ELISA	(iv) Codes for a protein involved in plasmid replication
(1) A-ii, B-iii, C-iv, D-i	(2) A-i, B-iii, C-iv, D-ii
(3) A-ii, B-iv, C-i, D-iii	(4) A-i, B-iv, C-ii, D-iii

18. If  $\Delta G^\circ$  of the reaction  $A \rightarrow B$  is  $-40\text{kJ/mol}$  under standard conditions then the reaction :

- (1) Will never reach equilibrium
- (2) Will proceed from left to right
- (3) Will not occur spontaneously
- (4) Will proceed from right to left

19. A widely used technique for cell disruption is :

- |                          |                                  |
|--------------------------|----------------------------------|
| (1) High-speed agitation | (2) Osmotic Shock                |
| (3) Grinding             | (4) High-pressure homogenisation |

20. If one starts with  $10,000 (10^4)$  cells in a culture that has a generation time of 2 hours, how many cells will be in the culture after 4 and 48 hours ?

- (1)  $4.0 \times 10^4$  cells,  $1.7 \times 10^{11}$  cells
- (2)  $4.2 \times 10^4$  cells,  $1.1 \times 10^{11}$  cells
- (3)  $4.6 \times 10^4$  cells,  $1.5 \times 10^{11}$  cells
- (4)  $4.8 \times 10^4$  cells,  $1.3 \times 10^{11}$  cells

21. Which phase has the condition of specific growth rate " $\mu = \mu_{max}$ " ?
- (1) Lag phase (2) Growth phase  
(3) Log phase (4) Death phase
22. What is an MPR rating on air filters ?
- (1) Magnitude performance rating  
(2) Micro-particle performance rating  
(3) Macro-particle performance rating  
(4) Moles per rating
23. A typical tubular centrifuge has a bowl of 2 to 5 inches in diameter and 9 to 30 inches in height with a maximum rotating speed of :
- (1) 15,000 to 50,000 rpm  
(2) 50,000 to 1,00,000 rpm  
(3) 1,00,000 to 1,50,000 rpm  
(4) 1,50,000 to 2,50,000 rpm
24. At the end of the batch culture, a glucose solution is added at a flow rate of 200 ml/h. If the culture volume after 2 hours of glucose addition is 1000 ml, the initial culture volume (in ml) is :
- (1) 600 ml (2) 800 ml (3) 1000 ml (4) 400 ml
25. Which of the following amino acids contain aromatic R groups ?
- (1) Tyrosine, Serine (2) Tryptophan, Histidine  
(3) Tryptophan, Phenylalanine (4) Leucine, Methionine

26. Which of the following is not true about Myoglobin ?
- (1) It is a single polypeptide of 153 amino acid residues with one molecule of heme.
  - (2) It has a single binding site for oxygen.
  - (3) The polypeptide of Myoglobin is made up of 10 helical segments connected by bends.
  - (4) It is typical of the family of proteins called globins.
27.  $\text{Ni}^{2+}$  serve as cofactor for which one of the following enzyme ?
- (1) Urease
  - (2) Cytochrome oxidase
  - (3) Pyruvate kinase
  - (4) Hexokinase
28. Repeating unit for polysaccharide chitin is :
- (1)  $(\beta 1 \rightarrow 4)\text{Glc}$
  - (2)  $(\beta 1 \rightarrow 4)\text{GlcNAc}$
  - (3)  $(\alpha 1 \rightarrow 6)\text{Glc}$
  - (4)  $(\alpha 1 \rightarrow 4)\text{Glc}$  with  $(\alpha 1 \rightarrow 6)\text{Glc}$
29. The number of base pairs per helical turn of the Z form of DNA is :
- (1) 10.5
  - (2) 10
  - (3) 11
  - (4) 12
30. The common name for fatty acid n-Octadecanoic acid is :
- (1) Stearic acid
  - (2) Myristic acid
  - (3) Lauric acid
  - (4) Palmitic acid
31. The weak intermolecular force that depends on the distance between atoms or molecules is :
- (1) Hydrogen bonds
  - (2) Ionic interactions
  - (3) Van der Waals interactions
  - (4) Hydrophobic interactions

32. The term Bioinformatics was coined by :
- (1) J. D. Watson (2) Pauline Hogeweg  
(3) Margaret Dayhoff (4) Frederic Sanger
33. Which of the following is not a variant of BLAST ?
- (1) BLASTN (2) TBLASTNX (3) BLASTP (4) BLASTX
34. The algorithm used in alignment of DNA sequences is :
- (1) BLAST (2) Multi align  
(3) Needleman Wunsch (4) CLUSTAL
35. Which one of the following databases is exclusively for protein ?
- (1) DDBJ (2) KEGG (3) EMBL (4) PBD
36. Which of the following is untrue about SCOP ?
- (1) It is constructed almost entirely based on manual examination of protein structures.  
(2) The SCOP families consist of proteins having low sequence identity (>30%).  
(3) It is a database for comparing and classifying protein structures.  
(4) The proteins are grouped into hierarchies of classes, folds, superfamilies, and families.
37. Which of the following approach is considered under the 'Ligand based drug designing' ?
- (1) Molecular docking (2) Pharmacophore modeling  
(3) QSAR modeling (4) both (2) and (3)

38. Lipinski's rule of five is used for :
- (1) Docking
  - (2) Similarity search
  - (3) Drug likeness
  - (4) Dynamics simulation
39. The computational methodology that tries to find the best matching between two molecules, a receptor and ligand are called :
- (1) Molecular fitting
  - (2) Molecular matching
  - (3) Molecular docking
  - (4) Molecule affinity checking
40. Which of the following helps in opening of DNA Double Helix in front of replication fork ?
- (1) Topoisomerase
  - (2) DNA polymerase I
  - (3) DNA gyrase
  - (4) DNA ligase
41. Fire Blight disease is related to which of the given fruits ?
- (1) Pineapple
  - (2) Orange
  - (3) Apple
  - (4) Banana
42. Up to 60% of all medicines used today exert their effects by influencing what structures in the cell membrane ?
- (1) Tyrosine-Kinase receptors
  - (2) Growth factors
  - (3) G Proteins
  - (4) Cholesterol
43. Which of the following signal molecule is NOT used for extracellular signaling ?
- (1) Autocrine
  - (2) Cyclic AMP
  - (3) Endocrine
  - (4) Paracrine



44. Which of the following enzymes do not mediate post-translational modification ?
- (1) Kinases (2) Ligases  
(3) Phosphatases (4) Helicases
45. Negative regulation of protein synthesis is accomplished by :
- (1) allosteric inhibition  
(2) the binding of RNA polymerase to the promoter  
(3) the binding of a repressor to the DNA  
(4) the binding of a repressor to the RNA polymerase
46. The function of the sigma factor of RNA polymerase is to :
- (1) assure that transcription ends at the proper point  
(2) assure that transcription begins at the proper point  
(3) assure that translation ends at the proper point  
(4) assure that translation begins at the proper point
47. Enhancers are regions that :
- (1) bind RNA polymerase  
(2) are adjacent to the TATA Box  
(3) are CAT box binding proteins  
(4) Modulate Transcription
48. Which pollution is not produced by automobile exhaust ?
- (1) SO<sub>2</sub> (2) Fly ash  
(3) Hydrocarbons (4) CO

- 49.** Detritus food chain starts from :
- (1) Green plants (2) Dead organic matter  
(3) Both (1) and (2) (4) None of the above
- 50.** Agenda of Kyoto protocol is :
- (1) Control of ozone depletion  
(2) Regulation of hazardous waste  
(3) Control the source of greenhouse gases  
(4) None of the above
- 51.** Ozone layer present in :
- (1) Stratosphere (2) Troposphere  
(3) Mesosphere (4) Thermosphere
- 52.** Bioaugmentation involves :
- (1) Eliminating sludge  
(2) Plants usage for bioremediation  
(3) Addition of microbes to a cleanup site  
(4) Bioventing
- 53.** Which one of the following is related to ex situ conservation of threatened animals and plants ?
- (1) Amazon rain forest (2) Himalayan region  
(3) Wildlife safari park (4) Biodiversity hotspots

54. Which one is green manure/biofertilizer ?  
(1) Sesbania            (2) Rice            (3) Oat            (4) Maize
55. Which of the following is not used as a biopesticide ?  
(1) *Trichoderma harzianum*            (2) *Nucleopolyhedrovirus*  
(3) *Xanthomonas campestris*            (4) *Bacillus thuringiensis*
56. A woman with two genes for haemophilia and a gene for colour blindness on one of the X chromosomes marries a normal man. How will be the progeny ?  
(1) Haemophilic and colour blind daughters  
(2) All sons and daughters haemophilic and colourblind  
(3) 50% haemophilic colourblind sons and 50% normal sons  
(4) 50% haemophilic daughters and 50% colourblind daughters
57. When we cross red flowered variety of *Mirabilis jalapa* with white flowered variety we get pink flowers. This is called :  
(1) Complete dominance            (2) Incomplete dominance  
(3) Co dominance            (4) Epistasis
58. Mutation is generally due to :  
(1) Lethal gene            (2) Dominant gene  
(3) Recessive gene            (4) Complementary gene
59. Tetrad analysis in *Neurospora* confirms that crossing over occurs at :  
(1) Single stranded stage            (2) 2-stranded stage  
(3) 3-stranded stage            (4) 4-stranded stage

60. Cytoplasmic male sterility in Maize is manifestation of interaction between :
- (1) Chloroplast and Nuclear genes
  - (2) Mitochondrial and Nuclear genes
  - (3) Chloroplast and mitochondrial genes
  - (4) Cytoplasmic factors and male sterile genes
61. If the frequency of males affected with colourblindness in the population is 0.2, what will be the expected frequency of affected females ?
- (1) 0.40                      (2) 0.04                      (3) 0.02                      (4) 0.20
62. Which one of the following frequencies of genotype TT, Tt, tt satisfy the Hardy Weinberg Equation ?
- (1) 0.64, 0.32, 0.04                      (2) 0.36, 0.55, 0.09
- (3) 0.29, 0.42, 0.29                      (4) 0.64, 0.27, 0.09
63. What approximately is the function of genetic variation in the nuclear genome that is expected to have a harmful effect on gene function ?
- (1) 1%                      (2) 10%                      (3) 20%                      (4) 100%
64. Noble prize was awarded for the invention of which of the following pair of ionisation techniques ?
- (1) Photoionization and Electrospray ionisation
  - (2) MALDI and Chemical ionisation
  - (3) MALDI and Electrospray ionisation
  - (4) Fast atom bombardment ionisation and Photo ionization

65. Mass spectrometry is used in :
- (1) Protein separation
  - (2) Protein identification
  - (3) Protein analysis
  - (4) Both (2) and (3)
66. Protein-protein interactions can be identified by :
- (1) Phage display
  - (2) Isoelectric focusing
  - (3) Microarrays
  - (4) Hierarchical clustering
67. All are genome sequence strategies except :
- (1) Short gun library
  - (2) Whole genome shotgun sequencing
  - (3) Edman degradation method
  - (4) Directed gene sequencing
68. What is alphoid DNA ?
- (1) Highly repetitive DNA
  - (2) DNA repeats found in the centromere region
  - (3) Large-sized DNA
  - (4) Sequences that are unique
69. What is the detection technique of auxotrophs ?
- (1) Replica plating
  - (2) Spread plating
  - (3) Streaking
  - (4) Pouring



70. Choose the technique based on antigen-antibody interaction :
- (1) PCR (2) ELISA  
(3) Electrophoresis (4) Widal test
71. Copyright act firstly introduced in which country ?
- (1) England (2) France  
(3) Germany (4) America
72. Intellectual property rights protect use of information and ideas that are of :
- (1) Social value (2) Moral value  
(3) Commercial value (4) None of the above
73. Which among the following is first product to be tagged with GI in India ?
- (1) Darjeeling tea (2) Malabar pepper  
(3) Kullu shawl (4) Basmati
74. Which one is/are Patent database ?
- (1) Espacenet (2) CIPO  
(3) USPTO (4) All of the above
75. GEAC stands for :
- (1) Genetic Ethical Approval Committee  
(2) Genetic Engineering Active Commission  
(3) Genetic Engineering Approval Committee  
(4) Genetic Ethical Active Commission

76. Ebola virus comes under which biosafety level ?
- (1) 1                      (2) 2                      (3) 3                      (4) 4
77. The genetically modified brinjal in India has been developed for :
- (1) Insect resistance                      (2) Enhancing self life  
(3) Enhancing mineral content                      (4) Draught resistant
78. As per the Indian patent act 1970, a patent is granted for limited period of :
- (1) 10 years                      (2) 50 years  
(3) 20 years                      (4) 40 years
79. Continuity of cytoplasm through cell to cell is controlled by :
- (1) Plasmodesmata                      (2) Plasma membrane  
(3) Cell wall                      (4) Nucleolus
80. Which one of the following contains hydrolytic enzymes ?
- (1) Mitochondria                      (2) Lysosome  
(3) Ribosome                      (4) Peroxisome
81. Which organelle of plant cells secretes polysaccharide and protein to make cell walls ?
- (1) Golgi bodies                      (2) Mitochondria  
(3) Lysosome                      (4) Chloroplast

82. Information pieces of split gene are :

- (1) Exons (2) Introns  
(3) Pseudo genes (4) Operons

83. Identify the vector suitable to clone long fragments of DNA.

- (1) Phage vectors (2) Bacterial Plasmids  
(3) Yeast Plasmids (4) Cosmids

84. Programmed cell death is termed as :

- (1) Metastasis (2) Apoptosis  
(3) Proliferation (4) Mitotic termination

85. Match the following :

- |                |  |
|----------------|--|
| I. Zygotene    | A. Crossing Over                                   |
| II. Pachytene  | B. Pairing of Homologous chromosomes               |
| III. Diplotene | C. Disappearance of nucleolus and nuclear membrane |
| IV. Diakinesis | D. Beginning of separation of Paired chromosomes   |

(1) I-A, II-B, III-C, IV-D

(2) I-B, II-A, III-C, IV-D

(3) I-B, II-A, III-D, IV-C

(4) I-A, II-D, III-B, IV-C

A

86. Source organism of Restriction endonuclease Taq I is :
- (1) *Bacillus globigli*
  - (2) *Arthrobacter luteus*
  - (3) *Thermus aquaticus*
  - (4) *Thiobacillus thioparus*
87. In western blotting technique which of the following compound identify by lectins ?
- (1) RNA
  - (2) antibody
  - (3) glycoprotein
  - (4) antibiotics
88. The two antibiotic resistance genes on vector pBR<sup>322</sup> are for :
- (1) Tetracycline and Kanamycin
  - (2) Ampicillin and Chloramphenicol
  - (3) Ampicillin and Tetracycline
  - (4) Chloramphenicol and Gentamycin
89. Reverse transcriptase-PCR used to amplify :
- (1) cDNA
  - (2) mRNA
  - (3) DNA
  - (4) All of the above

90. Which of the following DNA sequencing method is known as Chemical sequencing method ?
- (1) Sanger Method
  - (2) Maxam-Gilbert Method
  - (3) NGS
  - (4) None of the above
91. Genome wise gene expression analysis is performed by using :
- (1) Northern analysis
  - (2) DNA micro arrays
  - (3) Real Time PCR
  - (4) RT-PCR
92. Which of the following is commonly used in DNA fingerprinting ?
- (1) RFLP
  - (2) Copy number variation
  - (3) Variants of unknown significance
  - (4) None of the above
93. Sucrose density gradient centrifugation method can be used to estimate the size of :
- (1) Proteins
  - (2) RNA molecules
  - (3) Ribosomes
  - (4) All of the above



- A
94. Beer-Lambert's law gives the relationship between which of the following ?
- (1) Reflected radiation and concentration
  - (2) Scattered radiation and concentration
  - (3) Energy absorption and concentration
  - (4) Energy absorption and reflected radiation
95. Ion exchange chromatography is based on the :
- (1) Electrostatic attraction
  - (2) Electric mobility of ionic species
  - (3) Adsorption chromatography
  - (4) Partition chromatography
96. In iso-electric focussing, proteins are separated on the basis of their :
- (1) Relative content of positively charged residue only
  - (2) Relative content of negatively charged residue only
  - (3) Size
  - (4) Relative content of positively and negatively charged residues
97. In fluorescence spectroscopy, emission spectra are obtained by keeping :
- (1) Excitation wavelength constant
  - (2) Emission wavelength constant
  - (3) Both excitation and emission wavelength constant
  - (4) Both excitation and emission wavelength varying

98. Raman spectroscopy is a spectroscopic technique based on ..... of monochromatic light.
- (1) Inelastic scattering
  - (2) Elastic scattering
  - (3) Plastic scattering
  - (4) Neolastic scattering
99. Which one is not pre requisite of  $\chi^2$  test' ?
- (1) Data should be raw
  - (2) Data should be qualitative
  - (3) Data should be random
  - (4) Observation frequency should be less than 5
100. If green light of wavelength 500 nm and objective lens with NA 1.4 is used, then resolution will be :
- (1) 178 X
  - (2) 178 nm
  - (3) 178 m
  - (4) None of the above

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**B**

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(3) G Proteins      (4) Cholesterol
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7. Enhancers are regions that :
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  - (2) are adjacent to the TATA Box
  - (3) are CAT box binding proteins
  - (4) Modulate Transcription
8. Which pollution is not produced by automobile exhaust ?
- (1) SO<sub>2</sub>
  - (2) Fly ash
  - (3) Hydrocarbons
  - (4) CO
9. Detritus food chain starts from :
- (1) Green plants
  - (2) Dead organic matter
  - (3) Both (1) and (2)
  - (4) None of the above
10. Agenda of Kyoto protocol is :
- (1) Control of ozone depletion
  - (2) Regulation of hazardous waste
  - (3) Control the source of greenhouse gases
  - (4) None of the above
11. Copyright act firstly introduced in which country ?
- (1) England
  - (2) France
  - (3) Germany
  - (4) America



12. Intellectual property rights protect use of information and ideas that are of :
- (1) Social value (2) Moral value  
(3) Commercial value (4) None of the above
13. Which among the following is first product to be tagged with GI in India ?
- (1) Darjeeling tea (2) Malabar pepper  
(3) Kullu shawl (4) Basmati
14. Which one is/are Patent database ?
- (1) Espacenet (2) CIPO  
(3) USPTO (4) All of the above
15. GEAC stands for :
- (1) Genetic Ethical Approval Committee  
(2) Genetic Engineering Active Commission  
(3) Genetic Engineering Approval Committee  
(4) Genetic Ethical Active Commission
16. Ebola virus comes under which biosafety level ?
- (1) 1 (2) 2 (3) 3 (4) 4
17. The genetically modified brinjal in India has been developed for :
- (1) Insect resistance (2) Enhancing self life  
(3) Enhancing mineral content (4) Draught resistant

18. As per the Indian patent act 1970, a patent is granted for limited period of :
- (1) 10 years (2) 50 years  
(3) 20 years (4) 40 years
19. Continuity of cytoplasm through cell to cell is controlled by :
- (1) Plasmodesmata (2) Plasma membrane  
(3) Cell wall (4) Nucleolus
20. Which one of the following contains hydrolytic enzymes ?
- (1) Mitochondria (2) Lysosome  
(3) Ribosome (4) Peroxisome
21. Genome wise gene expression analysis is performed by using :
- (1) Northern analysis  
(2) DNA micro arrays  
(3) Real Time PCR  
(4) RT-PCR
22. Which of the following is commonly used in DNA fingerprinting ?
- (1) RFLP  
(2) Copy number variation  
(3) Variants of unknown significance  
(4) None of the above

23. Sucrose density gradient centrifugation method can be used to estimate the size of :
- (1) Proteins
  - (2) RNA molecules
  - (3) Ribosomes
  - (4) All of the above
24. Beer-Lambert's law gives the relationship between which of the following ?
- (1) Reflected radiation and concentration
  - (2) Scattered radiation and concentration
  - (3) Energy absorption and concentration
  - (4) Energy absorption and reflected radiation
25. Ion exchange chromatography is based on the :
- (1) Electrostatic attraction
  - (2) Electric mobility of ionic species
  - (3) Adsorption chromatography
  - (4) Partition chromatography
26. In iso-electric focussing, proteins are separated on the basis of their :
- (1) Relative content of positively charged residue only
  - (2) Relative content of negatively charged residue only
  - (3) Size
  - (4) Relative content of positively and negatively charged residues

27. In fluorescence spectroscopy, emission spectra are obtained by keeping :
- (1) Excitation wavelength constant
  - (2) Emission wavelength constant
  - (3) Both excitation and emission wavelength constant
  - (4) Both excitation and emission wavelength varying
28. Raman spectroscopy is a spectroscopic technique based on ..... of monochromatic light.
- (1) Inelastic scattering
  - (2) Elastic scattering
  - (3) Plastic scattering
  - (4) Neolastic scattering
29. Which one is not pre requisite of  $\chi^2$  test' ?
- (1) Data should be raw
  - (2) Data should be qualitative
  - (3) Data should be random
  - (4) Observation frequency should be less than 5
30. If green light of wavelength 500 nm and objective lens with NA 1.4 is used, then resolution will be :
- |           |                       |
|-----------|-----------------------|
| (1) 178 X | (2) 178 nm            |
| (3) 178 m | (4) None of the above |

31. During EMP pathway, the ATP is produced through :
- (1) Oxidative phosphorylation
  - (2) Cyclic phosphorylation
  - (3) Substrate level phosphorylation
  - (4) None of the above
32.  $C_4$  plants are similar to  $C_3$  plants in having :
- (1) Kranz anatomy
  - (2)  $C_3$  pathway of  $CO_2$  fixation
  - (3) Dimorphic chloroplasts
  - (4) High  $CO_2$  compensation point
33. Enzymes concerned with ammonia assimilation is :
- |                 |                          |
|-----------------|--------------------------|
| (1) Nitrogenase | (2) Arginase             |
| (3) Urease      | (4) Glutamine synthetase |
34. Under water stress conditions which of the following does not increase in leaves ?
- |             |                       |
|-------------|-----------------------|
| (1) Betaine | (2) ABA               |
| (3) Proline | (4) Nitrate reductase |
35. RFLP study is a technique for :
- (1) Transferring genes from unrelated species
  - (2) Isolating a single gene
  - (3) Isolating single gene product
  - (4) Identifying genetic (DNA) homologies

36. Genetically engineered male sterile crop plants have been produced by involving :
- (1) Opaque 2 gene
  - (2) Virus coat protein genes
  - (3) Barnase gene
  - (4) Chitinase gene
37. The essential component of Ti Plasmid required for transfer and integration of T DNA into the plant genome is :
- (1) Origin of replication
  - (2) Virulence genes
  - (3) Nopaline utilization gene
  - (4) All of the above
38. Artificial seeds are produced by :
- (1) Immobilization of somatic embryos
  - (2) Biotransformation
  - (3) Biosynthesis
  - (4) Enzymatic isolation
39. Which cell line is used to produce recombinant sex hormones ?
- (1) HELA cell line
  - (2) VERO cell line
  - (3) CHO cell line
  - (4) BHK cell line
40. The technique used in animal biotechnology for the rapid multiplication and production of animals with a desirable genotype is :
- (1) Protoplast Fusion and Embryo Transfer
  - (2) Hybrid Selection and Embryo Transfer
  - (3) In Vitro Fertilization and Embryo Transfer
  - (4) All of the above



41. Ozone layer present in :
- (1) Stratosphere
  - (2) Troposphere
  - (3) Mesosphere
  - (4) Thermosphere
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- (1) Eliminating sludge
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  - (2) Himalayan region
  - (3) Wildlife safari park
  - (4) Biodiversity hotspots
44. Which one is green manure/biofertilizer ?
- (1) Sesbania
  - (2) Rice
  - (3) Oat
  - (4) Maize
45. Which of the following is not used as a biopesticide ?
- (1) *Trichoderma harzianum*
  - (2) *Nucleopolyhedrovirus*
  - (3) *Xanthomonas campestris*
  - (4) *Bacillus thuringiensis*

46. A woman with two genes for haemophilia and a gene for colour blindness on one of the X chromosomes marries a normal man. How will be the progeny ?
- (1) Haemophilic and colour blind daughters
  - (2) All sons and daughters haemophilic and colourblind
  - (3) 50% haemophilic colourblind sons and 50% normal sons
  - (4) 50% haemophilic daughters and 50% colourblind daughters
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  - (3) Recessive gene
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  - (2) 2-stranded stage
  - (3) 3-stranded stage
  - (4) 4-stranded stage
50. Cytoplasmic male sterility in Maize is manifestation of interaction between :
- (1) Chloroplast and Nuclear genes
  - (2) Mitochondrial and Nuclear genes
  - (3) Chloroplast and mitochondrial genes
  - (4) Cytoplasmic factors and male sterile genes

51. If the frequency of males affected with colourblindness in the population is 0.2, what will be the expected frequency of affected females ?
- (1) 0.40                      (2) 0.04                      (3) 0.02                      (4) 0.20
52. Which one of the following frequencies of genotype TT, Tt, tt satisfy the Hardy Weinberg Equation ?
- (1) 0.64, 0.32, 0.04                      (2) 0.36, 0.55, 0.09  
(3) 0.29, 0.42, 0.29                      (4) 0.64, 0.27, 0.09
53. What approximately is the function of genetic variation in the nuclear genome that is expected to have a harmful effect on gene function ?
- (1) 1%                      (2) 10%                      (3) 20%                      (4) 100%
54. Noble prize was awarded for the invention of which of the following pair of ionisation techniques ?
- (1) Photoionization and Electrospray ionisation  
(2) MALDI and Chemical ionisation  
(3) MALDI and Electrospray ionisation  
(4) Fast atom bombardment ionisation and Photo ionization
55. Mass spectrometry is used in :
- (1) Protein separation                      (2) Protein identification  
(3) Protein analysis                      (4) Both (2) and (3)

56. Protein-protein interactions can be identified by :
- (1) Phage display
  - (2) Isoelectric focusing
  - (3) Microarrays
  - (4) Hierarchical clustering
57. All are genome sequence strategies except :
- (1) Short gun library
  - (2) Whole genome shotgun sequencing
  - (3) Edman degradation method
  - (4) Directed gene sequencing
58. What is alphoid DNA ?
- (1) Highly repetitive DNA
  - (2) DNA repeats found in the centromere region
  - (3) Large-sized DNA
  - (4) Sequences that are unique
59. What is the detection technique of auxotrophs ?
- (1) Replica plating
  - (2) Spread plating
  - (3) Streaking
  - (4) Pouring
60. Choose the technique based on antigen-antibody interaction :
- (1) PCR
  - (2) ELISA
  - (3) Electrophoresis
  - (4) Widal test

61. Which phase has the condition of specific growth rate " $\mu = \mu_{max}$ " ?
- (1) Lag phase (2) Growth phase  
(3) Log phase (4) Death phase
62. What is an MPR rating on air filters ?
- (1) Magnitude performance rating  
(2) Micro-particle performance rating  
(3) Macro-particle performance rating  
(4) Moles per rating
63. A typical tubular centrifuge has a bowl of 2 to 5 inches in diameter and 9 to 30 inches in height with a maximum rotating speed of :
- (1) 15,000 to 50,000 rpm  
(2) 50,000 to 1,00,000 rpm  
(3) 1,00,000 to 1,50,000 rpm  
(4) 1,50,000 to 2,50,000 rpm
64. At the end of the batch culture, a glucose solution is added at a flow rate of 200 ml/h. If the culture volume after 2 hours of glucose addition is 1000 ml, the initial culture volume (in ml) is :
- (1) 600 ml (2) 800 ml (3) 1000 ml (4) 400 ml
65. Which of the following amino acids contain aromatic R groups ?
- (1) Tyrosine, Serine (2) Tryptophan, Histidine  
(3) Tryptophan, Phenylalanine (4) Leucine, Methionine



66. Which of the following is not true about Myoglobin ?
- (1) It is a single polypeptide of 153 amino acid residues with one molecule of heme.
  - (2) It has a single binding site for oxygen.
  - (3) The polypeptide of Myoglobin is made up of 10 helical segments connected by bends.
  - (4) It is typical of the family of proteins called globins.
67.  $\text{Ni}^{2+}$  serve as cofactor for which one of the following enzyme ?
- (1) Urease
  - (2) Cytochrome oxidase
  - (3) Pyruvate kinase
  - (4) Hexokinase
68. Repeating unit for polysaccharide chitin is :
- (1)  $(\beta 1 \rightarrow 4)\text{Glc}$
  - (2)  $(\beta 1 \rightarrow 4)\text{GlcNAc}$
  - (3)  $(\alpha 1 \rightarrow 6)\text{Glc}$
  - (4)  $(\alpha 1 \rightarrow 4)\text{Glc}$  with  $(\alpha 1 \rightarrow 6)\text{Glc}$
69. The number of base pairs per helical turn of the Z form of DNA is :
- (1) 10.5
  - (2) 10
  - (3) 11
  - (4) 12
70. The common name for fatty acid n-Octadecanoic acid is :
- (1) Stearic acid
  - (2) Myristic acid
  - (3) Lauric acid
  - (4) Palmitic acid
71. Animal cell cultures are used widely for the production of :
- (1) Insulin
  - (2) Somatostatin
  - (3) MABS
  - (4) Thyroxine
72. The virus commonly used to infect cell cultures for the production of interferon is :
- (1) Corona virus
  - (2) Sendai virus
  - (3) Polio virus
  - (4) Smallpox virus



B

73. Which of the following is the structural fiber in a cell cultural system ?
- (1) Collagen (2) Elastin  
(3) Fibronectin (4) Both (1) and (2)
74. Which of the following media is used for the maturation of oocytes ?
- (1) DMEM (2) TCM-199  
(3) Ham's F-10 (4) Both (2) and (3)
75. In ICSI the sperm is injected in :
- (1) Nucleoplasm (2) Cytoplasm  
(3) Perivitelline space (4) None
76. The HAT medium used for the selection of fused hybrid cells in hybridoma culture was introduced by :
- (1) Littlefield and Miller (2) Kohler and Milstein  
(3) Frish and Jentoft (4) Eagle and Karle

77. Match the Columns :

Column-I	Column-II
(A) Rosie	(i) a-I antitrypsin
(B) ROP	(ii) Protein-enriched milk
(C) Emphysema	(iii) Test to detect antigen or antibody
(D) ELISA	(iv) Codes for a protein involved in plasmid replication
(1) A-ii, B-iii, C-iv, D-i	(2) A-i, B-iii, C-iv, D-ii
(3) A-ii, B-iv, C-i, D-iii	(4) A-i, B-iv, C-ii, D-iii

P. T. O.

78. If  $\Delta G^\circ$  of the reaction  $A \rightarrow B$  is  $-40\text{kJ/mol}$  under standard conditions then the reaction :
- (1) Will never reach equilibrium
  - (2) Will proceed from left to right
  - (3) Will not occur spontaneously
  - (4) Will proceed from right to left
79. A widely used technique for cell disruption is :
- (1) High-speed agitation
  - (2) Osmotic Shock
  - (3) Grinding
  - (4) High-pressure homogenisation
80. If one starts with  $10,000 (10^4)$  cells in a culture that has a generation time of 2 hours, how many cells will be in the culture after 4 and 48 hours ?
- (1)  $4.0 \times 10^4$  cells,  $1.7 \times 10^{11}$  cells
  - (2)  $4.2 \times 10^4$  cells,  $1.1 \times 10^{11}$  cells
  - (3)  $4.6 \times 10^4$  cells,  $1.5 \times 10^{11}$  cells
  - (4)  $4.8 \times 10^4$  cells,  $1.3 \times 10^{11}$  cells
81. Which organelle of plant cells secretes polysaccharide and protein to make cell walls ?
- |                  |                  |
|------------------|------------------|
| (1) Golgi bodies | (2) Mitochondria |
| (3) Lysosome     | (4) Chloroplast  |
82. Information pieces of split gene are :
- |                  |             |
|------------------|-------------|
| (1) Exons        | (2) Introns |
| (3) Pseudo genes | (4) Operons |

63. Identify the vector suitable to clone long fragments of DNA.

- (1) Phage vectors (2) Bacterial Plasmids  
(3) Yeast Plasmids (4) Cosmids

64. Programmed cell death is termed as :

- (1) Metastasis (2) Apoptosis  
(3) Proliferation (4) Mitotic termination

65. Match the following :

- |                |  |
|----------------|--|
| I. Zygotene    | A. Crossing Over                                   |
| II. Pachytene  | B. Pairing of Homologous chromosomes               |
| III. Diplotene | C. Disappearance of nucleolus and nuclear membrane |
| IV. Diakinesis | D. Beginning of separation of Paired chromosomes   |

- (1) I-A, II-B, III-C, IV-D  
(2) I-B, II-A, III-C, IV-D  
(3) I-B, II-A, III-D, IV-C  
(4) I-A, II-D, III-B, IV-C

66. Source organism of Restriction endonuclease Taq I is :

- (1) *Bacillus globigli* (2) *Arthrobacter luteus*  
(3) *Thermus aquaticus* (4) *Thiobacillus thioparus*

87. In western blotting technique which of the following compound identify by lectins ?
- (1) RNA (2) antibody  
(3) glycoprotein (4) antibiotics
88. The two antibiotic resistance genes on vector pBR<sup>322</sup> are for :
- (1) Tetracycline and Kanamycin  
(2) Ampicillin and Chloramphenicol  
(3) Ampicillin and Tetracycline  
(4) Chloramphenicol and Gentamycin
89. Reverse transcriptase-PCR used to amplify :
- (1) cDNA (2) mRNA  
(3) DNA (4) All of the above
90. Which of the following DNA sequencing method is known as Chemical sequencing method ?
- (1) Sanger Method (2) Maxam-Gilbert Method  
(3) NGS (4) None of the above
91. The weak intermolecular force that depends on the distance between atoms or molecules is :
- (1) Hydrogen bonds (2) Ionic interactions  
(3) Van der Waals interactions (4) Hydrophobic interactions

92. The term Bioinformatics was coined by :
- (1) J. D. Watson (2) Pauline Hogeweg  
(3) Margaret Dayhoff (4) Frederic Sanger
93. Which of the following is not a variant of BLAST ?
- (1) BLASTN (2) TBLASTNX  
(3) BLASTP (4) BLASTX
94. The algorithm used in alignment of DNA sequences is :
- (1) BLAST (2) Multi align  
(3) Needleman Wunsch (4) CLUSTAL
95. Which one of the following databases is exclusively for protein ?
- (1) DDBJ (2) KEGG  
(3) EMBL (4) PBD
96. Which of the following is untrue about SCOP ?
- (1) It is constructed almost entirely based on manual examination of protein structures.  
(2) The SCOP families consist of proteins having low sequence identity (>30%).  
(3) It is a database for comparing and classifying protein structures.  
(4) The proteins are grouped into hierarchies of classes, folds, superfamilies, and families.

97. Which of the following approach is considered under the 'Ligand based drug designing' ?
- (1) Molecular docking (2) Pharmacophore modeling  
(3) QSAR modeling (4) both (2) and (3)
98. Lipinski's rule of five is used for :
- (1) Docking (2) Similarity search  
(3) Drug likeness (4) Dynamics simulation
99. The computational methodology that tries to find the best matching between two molecules, a receptor and ligand are called :
- (1) Molecular fitting (2) Molecular matching  
(3) Molecular docking (4) Molecule affinity checking
100. Which of the following helps in opening of DNA Double Helix in front of replication fork ?
- (1) Topoisomerase (2) DNA polymerase I  
(3) DNA gyrase (4) DNA ligase



(DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU  
ARE ASKED TO DO SO)

C

SET-Y

PHD/URS-EE-DEC-2022

SUBJECT : Bio-Tech. Engineering

10043

Sr. No. ....

Time : 1¼ Hours

Max. Marks : 100

Total Questions : 100

Roll No. (in figures) \_\_\_\_\_ (in words) \_\_\_\_\_

Name \_\_\_\_\_ Date of Birth \_\_\_\_\_

Father's Name \_\_\_\_\_ Mother's Name \_\_\_\_\_

Date of Examination \_\_\_\_\_

\_\_\_\_\_  
(Signature of the Candidate)

\_\_\_\_\_  
(Signature of the Invigilator)

**CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE  
STARTING THE QUESTION PAPER.**

1. **All questions are compulsory.**
2. The candidates **must return** the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
4. Question Booklet along with answer key of all the A, B, C & D code shall be got uploaded on the University website immediately after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the Question Booklet/Answer Key within 24 hours of uploading the same on the University Website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case, will be considered.
5. The candidate **must not** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers **must not** be ticked in the question booklet.
6. **There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.**
7. Use only **Black or Blue Ball Point Pen** of good quality in the OMR Answer-Sheet.
8. *Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after starting of the examination.*

PHD/URS-EE-2022/(Bio-Tech. Engg.)(SET-Y)/(C)

SEAL

1. Which phase has the condition of specific growth rate " $\mu = \mu_{max}$ " ?
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25. Match the following :
- I. Zygotene A. Crossing Over  
II. Pachytene B. Pairing of Homologous chromosomes  
III. Diplotene C. Disappearance of nucleolus and nuclear membrane  
IV. Diakinesis D. Beginning of separation of Paired chromosomes
- (1) I-A, II-B, III-C, IV-D  
(2) I-B, II-A, III-C, IV-D  
(3) I-B, II-A, III-D, IV-C  
(4) I-A, II-D, III-B, IV-C
26. Source organism of Restriction endonuclease Taq I is :
- (1) *Bacillus globigli* (2) *Arthrobacter luteus*  
(3) *Thermus aquaticus* (4) *Thiobacillus thioparus*



27. In western blotting technique which of the following compound identify by lectins ?
- (1) RNA (2) antibody  
(3) glycoprotein (4) antibiotics
28. The two antibiotic resistance genes on vector pBR<sup>322</sup> are for :
- (1) Tetracycline and Kanamycin  
(2) Ampicillin and Chloramphenicol  
(3) Ampicillin and Tetracycline  
(4) Chloramphenicol and Gentamycin
29. Reverse transcriptase-PCR used to amplify :
- (1) cDNA (2) mRNA  
(3) DNA (4) All of the above
30. Which of the following DNA sequencing method is known as Chemical sequencing method ?
- (1) Sanger Method (2) Maxam-Gilbert Method  
(3) NGS (4) None of the above
31. Copyright act firstly introduced in which country ?
- (1) England (2) France  
(3) Germany (4) America

32. Intellectual property rights protect use of information and ideas that are of
- (1) Social value (2) Moral value  
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- (1) Genetic Ethical Approval Committee  
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36. Ebola virus comes under which biosafety level ?
- (1) 1 (2) 2 (3) 3 (4) 4
37. The genetically modified brinjal in India has been developed for :
- (1) Insect resistance (2) Enhancing self life  
(3) Enhancing mineral content (4) Draught resistant

38. As per the Indian patent act 1970, a patent is granted for limited period of :
- (1) 10 years (2) 50 years  
(3) 20 years (4) 40 years
39. Continuity of cytoplasm through cell to cell is controlled by :
- (1) Plasmodesmata (2) Plasma membrane  
(3) Cell wall (4) Nucleolus
40. Which one of the following contains hydrolytic enzymes ?
- (1) Mitochondria (2) Lysosome  
(3) Ribosome (4) Peroxisome
41. Animal cell cultures are used widely for the production of :
- (1) Insulin (2) Somatostatin  
(3) MABS (4) Thyroxine
42. The virus commonly used to infect cell cultures for the production of interferon is :
- (1) Corona virus (2) Sendai virus  
(3) Polio virus (4) Smallpox virus
43. Which of the following is the structural fiber in a cell cultural system ?
- (1) Collagen (2) Elastin  
(3) Fibronectin (4) Both (1) and (2)

44. Which of the following media is used for the maturation of oocytes ?
- (1) DMEM (2) TCM-199  
(3) Ham's F-10 (4) Both (2) and (3)
45. In ICSI the sperm is injected in :
- (1) Nucleoplasm (2) Cytoplasm  
(3) Perivitelline space (4) None
46. The HAT medium used for the selection of fused hybrid cells in hybridoma culture was introduced by :
- (1) Littlefield and Miller (2) Kohler and Milstein  
(3) Frish and Jentoft (4) Eagle and Karle
47. Match the Columns :

**Column-I****Column-II**

- (A) Rosie (i) a-I antitrypsin  
(B) ROP (ii) Protein-enriched milk  
(C) Emphysema (iii) Test to detect antigen or antibody  
(D) ELISA (iv) Codes for a protein involved in plasmid replication

- (1) A-ii, B-iii, C-iv, D-i  
(2) A-i, B-iii, C-iv, D-ii  
(3) A-ii, B-iv, C-i, D-iii  
(4) A-i, B-iv, C-ii, D-iii

48. If  $\Delta G^\circ$  of the reaction  $A \rightarrow B$  is  $-40\text{kJ/mol}$  under standard conditions then the reaction :

- (1) Will never reach equilibrium
- (2) Will proceed from left to right
- (3) Will not occur spontaneously
- (4) Will proceed from right to left

49. A widely used technique for cell disruption is :

- (1) High-speed agitation
- (2) Osmotic Shock
- (3) Grinding
- (4) High-pressure homogenisation

50. If one starts with  $10,000 (10^4)$  cells in a culture that has a generation time of 2 hours, how many cells will be in the culture after 4 and 48 hours ?

- (1)  $4.0 \times 10^4$  cells,  $1.7 \times 10^{11}$  cells
- (2)  $4.2 \times 10^4$  cells,  $1.1 \times 10^{11}$  cells
- (3)  $4.6 \times 10^4$  cells,  $1.5 \times 10^{11}$  cells
- (4)  $4.8 \times 10^4$  cells,  $1.3 \times 10^{11}$  cells

51. The weak intermolecular force that depends on the distance between atoms or molecules is :

- (1) Hydrogen bonds
- (2) Ionic interactions
- (3) Van der Waals interactions
- (4) Hydrophobic interactions

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- (1) Topoisomerase (2) DNA polymerase I  
(3) DNA gyrase (4) DNA ligase
61. During EMP pathway, the ATP is produced through :
- (1) Oxidative phosphorylation  
(2) Cyclic phosphorylation  
(3) Substrate level phosphorylation  
(4) None of the above
62.  $C_4$  plants are similar to  $C_3$  plants in having :
- (1) Kranz anatomy  
(2)  $C_3$  pathway of  $CO_2$  fixation  
(3) Dimorphic chloroplasts  
(4) High  $CO_2$  compensation point
63. Enzymes concerned with ammonia assimilation is :
- (1) Nitrogenase (2) Arginase  
(3) Urease (4) Glutamine synthetase

64. Under water stress conditions which of the following does not increase in leaves ?
- (1) Betaine (2) ABA  
(3) Proline (4) Nitrate reductase
65. RFLP study is a technique for :
- (1) Transferring genes from unrelated species  
(2) Isolating a single gene  
(3) Isolating single gene product  
(4) Identifying genetic (DNA) homologies
66. Genetically engineered male sterile crop plants have been produced by involving :
- (1) Opaque 2 gene (2) Virus coat protein genes  
(3) Barnase gene (4) Chitinase gene
67. The essential component of Ti Plasmid required for transfer and integration of T DNA into the plant genome is :
- (1) Origin of replication (2) Virulence genes  
(3) Nopaline utilization gene (4) All of the above
68. Artificial seeds are produced by :
- (1) Immobilization of somatic embryos  
(2) Biotransformation  
(3) Biosynthesis  
(4) Enzymatic isolation

69. Which cell line is used to produce recombinant sex hormones ?  
(1) HEp-2 cell line (2) VERO cell line  
(3) CHO cell line (4) BHK cell line
70. The technique used in animal biotechnology for the rapid multiplication and production of animals with a desirable genotype is :  
(1) Protoplast Fusion and Embryo Transfer  
(2) Hybrid Selection and Embryo Transfer  
(3) In Vitro Fertilization and Embryo Transfer  
(4) All of the above
71. Fire Blight disease is related to which of the given fruits ?  
(1) Pineapple (2) Orange (3) Apple (4) Banana
72. Up to 60% of all medicines used today exert their effects by influencing what structures in the cell membrane ?  
(1) Tyrosine-Kinase receptors (2) Growth factors  
(3) G Proteins (4) Cholesterol
73. Which of the following signal molecule is NOT used for extracellular signaling ?  
(1) Autocrine (2) Cyclic AMP  
(3) Endocrine (4) Paracrine
74. Which of the following enzymes do not mediate post -translational modification ?  
(1) Kinases (2) Ligases  
(3) Phosphatases (4) Helicases
- PHD/URS-EE-2022/(Bio-Tech. Engg.)(SET-Y)/(C)**

75. Negative regulation of protein synthesis is accomplished by :
- (1) allosteric inhibition
  - (2) the binding of RNA polymerase to the promoter
  - (3) the binding of a repressor to the DNA
  - (4) the binding of a repressor to the RNA polymerase
76. The function of the sigma factor of RNA polymerase is to :
- (1) assure that transcription ends at the proper point
  - (2) assure that transcription begins at the proper point
  - (3) assure that translation ends at the proper point
  - (4) assure that translation begins at the proper point
77. Enhancers are regions that :
- (1) bind RNA polymerase
  - (2) are adjacent to the TATA Box
  - (3) are CAT box binding proteins
  - (4) Modulate Transcription
78. Which pollution is not produced by automobile exhaust ?
- |                     |             |
|---------------------|-------------|
| (1) SO <sub>2</sub> | (2) Fly ash |
| (3) Hydrocarbons    | (4) CO      |
79. Detritus food chain starts from :
- |                      |                         |
|----------------------|-------------------------|
| (1) Green plants     | (2) Dead organic matter |
| (3) Both (1) and (2) | (4) None of the above   |

80. Agenda of Kyoto protocols
- (1) Control of ozone depletion
  - (2) Regulation of hazardous waste
  - (3) Control the source of greenhouse gases
  - (4) None of the above
81. Genome wise gene expression analysis is performed by using :
- (1) Northern analysis
  - (2) DNA micro arrays
  - (3) Real Time PCR
  - (4) RT-PCR
82. Which of the following is commonly used in DNA fingerprinting ?
- (1) RFLP
  - (2) Copy number variation
  - (3) Variants of unknown significance
  - (4) None of the above
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- (1) Proteins
  - (2) RNA molecules
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  - (4) All of the above

- C C
84. Beer-Lambert's law gives the relationship between which of the following ?
- (1) Reflected radiation and concentration
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- (1) Electrostatic attraction
  - (2) Electric mobility of ionic species
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  - (4) Partition chromatography
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- (1) Relative content of positively charged residue only
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  - (3) Size
  - (4) Relative content of positively and negatively charged residues
87. In fluorescence spectroscopy, emission spectra are obtained by keeping :
- (1) Excitation wavelength constant
  - (2) Emission wavelength constant
  - (3) Both excitation and emission wavelength constant
  - (4) Both excitation and emission wavelength varying



88. Raman spectroscopy is a spectroscopic technique based on ..... of monochromatic light.

- (1) Inelastic scattering
- (2) Elastic scattering
- (3) Plastic scattering
- (4) Neolastic scattering

89. Which one is not pre requisite of  $\chi^2$  test' ?

- (1) Data should be raw
- (2) Data should be qualitative
- (3) Data should be random
- (4) Observation frequency should be less than 5

90. If green light of wavelength 500 nm and objective lens with NA 1.4 is used, then resolution will be :

- (1) 178 X
- (2) 178 nm
- (3) 178 m
- (4) None of the above

91. If the frequency of males affected with colourblindness in the population is 0.2, what will be the expected frequency of affected females ?

- (1) 0.40
- (2) 0.04
- (3) 0.02
- (4) 0.20

92. Which one of the following frequencies of genotype TT, Tt, tt satisfy the Hardy Weinberg Equation ?
- (1) 0.64, 0.32, 0.04                      (2) 0.36, 0.55, 0.09
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93. What approximately is the function of genetic variation in the nuclear genome that is expected to have a harmful effect on gene function ?
- (1) 1%                      (2) 10%                      (3) 20%                      (4) 100%
94. Noble prize was awarded for the invention of which of the following pair of ionisation techniques ?
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- (1) Phage display                      (2) Isoelectric focusing
- (3) Microarrays                      (4) Hierarchical clustering

97. All are genome sequence strategies except :
- (1) Short gun library
  - (2) Whole genome shotgun sequencing
  - (3) Edman degradation method
  - (4) Directed gene sequencing
98. What is alphoid DNA ?
- (1) Highly repetitive DNA
  - (2) DNA repeats found in the centromere region
  - (3) Large-sized DNA
  - (4) Sequences that are unique
99. What is the detection technique of auxotrophs ?
- |                     |                    |
|---------------------|--------------------|
| (1) Replica plating | (2) Spread plating |
| (3) Streaking       | (4) Pouring        |
100. Choose the technique based on antigen-antibody interaction :
- |                     |                |
|---------------------|----------------|
| (1) PCR             | (2) ELISA      |
| (3) Electrophoresis | (4) Widal test |

(DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU ARE ASKED TO DO SO)

**D**

**SET-Y**

**PHD/URS-EE-DEC-2022**

**SUBJECT : Bio-Tech. Engineering**

**10044**

Sr. No. ....

Time : 1¼ Hours

Max. Marks : 100

Total Questions : 100

Roll No. (in figures) \_\_\_\_\_ (in words) \_\_\_\_\_

Name \_\_\_\_\_ Date of Birth \_\_\_\_\_

Father's Name \_\_\_\_\_ Mother's Name \_\_\_\_\_

Date of Examination \_\_\_\_\_

\_\_\_\_\_  
(Signature of the Candidate)

\_\_\_\_\_  
(Signature of the Invigilator)

**CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.**

1. **All questions are compulsory.**

2. The candidates **must return** the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
4. Question Booklet along with answer key of all the A, B, C & D code shall be got uploaded on the University website immediately after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the Question Booklet/Answer Key within 24 hours of uploading the same on the University Website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case, will be considered.
5. The candidate **must not** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers **must not** be ticked in the question booklet.
6. **There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.**
7. Use only **Black or Blue Ball Point Pen** of good quality in the OMR Answer-Sheet.
8. **Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after starting of the examination.**

**PHD/URS-EE-2022/(Bio-Tech. Engg.)(SET-Y)/(D)**

SEAL

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- (2) 2
- (3) 3
- (4) 4

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31. Which phase has the condition of specific growth rate " $\mu = \mu_{max}$ " ?
- (1) Lag phase (2) Growth phase  
(3) Log phase (4) Death phase
32. What is an MPR rating on air filters ?
- (1) Magnitude performance rating  
(2) Micro-particle performance rating  
(3) Macro-particle performance rating  
(4) Moles per rating
33. A typical tubular centrifuge has a bowl of 2 to 5 inches in diameter and 9 to 30 inches in height with a maximum rotating speed of :
- (1) 15,000 to 50,000 rpm  
(2) 50,000 to 1,00,000 rpm  
(3) 1,00,000 to 1,50,000 rpm  
(4) 1,50,000 to 2,50,000 rpm
34. At the end of the batch culture, a glucose solution is added at a flow rate of 200 ml/h. If the culture volume after 2 hours of glucose addition is 1000 ml, the initial culture volume (in ml) is :
- (1) 600 ml (2) 800 ml (3) 1000 ml (4) 400 ml
35. Which of the following amino acids contain aromatic R groups ?
- (1) Tyrosine, Serine (2) Tryptophan, Histidine  
(3) Tryptophan, Phenylalanine (4) Leucine, Methionine

36. Which of the following is not true about Myoglobin ?
- (1) It is a single polypeptide of 153 amino acid residues with one molecule of heme.
  - (2) It has a single binding site for oxygen.
  - (3) The polypeptide of Myoglobin is made up of 10 helical segments connected by bends.
  - (4) It is typical of the family of proteins called globins.
37.  $\text{Ni}^{2+}$  serve as cofactor for which one of the following enzyme ?
- (1) Urease
  - (2) Cytochrome oxidase
  - (3) Pyruvate kinase
  - (4) Hexokinase
38. Repeating unit for polysaccharide chitin is :
- (1)  $(\beta 1 \rightarrow 4)\text{Glc}$
  - (2)  $(\beta 1 \rightarrow 4)\text{GlcNAc}$
  - (3)  $(\alpha 1 \rightarrow 6)\text{Glc}$
  - (4)  $(\alpha 1 \rightarrow 4)\text{Glc}$  with  $(\alpha 1 \rightarrow 6)\text{Glc}$
39. The number of base pairs per helical turn of the Z form of DNA is :
- (1) 10.5
  - (2) 10
  - (3) 11
  - (4) 12
40. The common name for fatty acid n-Octadecanoic acid is :
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  - (3) Edman degradation method
  - (4) Directed gene sequencing
48. What is alphoid DNA ?
- (1) Highly repetitive DNA
  - (2) DNA repeats found in the centromere region
  - (3) Large-sized DNA
  - (4) Sequences that are unique
49. What is the detection technique of auxotrophs ?
- |                     |                    |
|---------------------|--------------------|
| (1) Replica plating | (2) Spread plating |
| (3) Streaking       | (4) Pouring        |
50. Choose the technique based on antigen-antibody interaction :
- |                     |                |
|---------------------|----------------|
| (1) PCR             | (2) ELISA      |
| (3) Electrophoresis | (4) Widal test |
51. Which organelle of plant cells secretes polysaccharide and protein to make cell walls ?
- |                  |                  |
|------------------|------------------|
| (1) Golgi bodies | (2) Mitochondria |
| (3) Lysosome     | (4) Chloroplast  |

52. Information pieces of split gene are :

- |                  |             |
|------------------|-------------|
| (1) Exons        | (2) Introns |
| (3) Pseudo genes | (4) Operons |

53. Identify the vector suitable to clone long fragments of DNA.

- |                    |                        |
|--------------------|------------------------|
| (1) Phage vectors  | (2) Bacterial Plasmids |
| (3) Yeast Plasmids | (4) Cosmids            |

54. Programmed cell death is termed as :

- |                   |                         |
|-------------------|-------------------------|
| (1) Metastasis    | (2) Apoptosis           |
| (3) Proliferation | (4) Mitotic termination |

55. Match the following :

- |                |  |
|----------------|--|
| I. Zygotene    | A. Crossing Over                                   |
| II. Pachytene  | B. Pairing of Homologous chromosomes               |
| III. Diplotene | C. Disappearance of nucleolus and nuclear membrane |
| IV. Diakinesis | D. Beginning of separation of Paired chromosomes   |

(1) I-A, II-B, III-C, IV-D

(2) I-B, II-A, III-C, IV-D

(3) I-B, II-A, III-D, IV-C

(4) I-A, II-D, III-B, IV-C

56. Source organism of Restriction endonuclease Taq I is :

- (1) *Bacillus globigli*
- (2) *Arthrobacter luteus*
- (3) *Thermus aquaticus*
- (4) *Thiobacillus thioparus*

57. In western blotting technique which of the following compound identify by lectins ?

- (1) RNA
- (2) antibody
- (3) glycoprotein
- (4) antibiotics

58. The two antibiotic resistance genes on vector pBR<sup>322</sup> are for :

- (1) Tetracycline and Kanamycin
- (2) Ampicillin and Chloramphenicol
- (3) Ampicillin and Tetracycline
- (4) Chloramphenicol and Gentamycin

59. Reverse transcriptase-PCR used to amplify :

- (1) cDNA
- (2) mRNA
- (3) DNA
- (4) All of the above

60. Which of the following DNA sequencing method is known as Chemical sequencing method ?

- (1) Sanger Method
- (2) Maxam-Gilbert Method
- (3) NGS
- (4) None of the above

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61. Fire Blight disease is related to which of the given fruits ?
- (1) Pineapple (2) Orange  
(3) Apple (4) Banana
62. Up to 60% of all medicines used today exert their effects by influencing what structures in the cell membrane ?
- (1) Tyrosine-Kinase receptors (2) Growth factors  
(3) G Proteins (4) Cholesterol
63. Which of the following signal molecule is NOT used for extracellular signaling ?
- (1) Autocrine (2) Cyclic AMP  
(3) Endocrine (4) Paracrine
64. Which of the following enzymes do not mediate post -translational modification ?
- (1) Kinases (2) Ligases  
(3) Phosphatases (4) Helicases
65. Negative regulation of protein synthesis is accomplished by :
- (1) allosteric inhibition  
(2) the binding of RNA polymerase to the promoter  
(3) the binding of a repressor to the DNA  
(4) the binding of a repressor to the RNA polymerase

66. The function of the sigma factor of RNA polymerase is to :
- (1) assure that transcription ends at the proper point
  - (2) assure that transcription begins at the proper point
  - (3) assure that translation ends at the proper point
  - (4) assure that translation begins at the proper point
67. Enhancers are regions that :
- (1) bind RNA polymerase
  - (2) are adjacent to the TATA Box
  - (3) are CAT box binding proteins
  - (4) Modulate Transcription
68. Which pollution is not produced by automobile exhaust ?
- |                     |             |
|---------------------|-------------|
| (1) SO <sub>2</sub> | (2) Fly ash |
| (3) Hydrocarbons    | (4) CO      |
69. Detritus food chain starts from :
- |                      |                         |
|----------------------|-------------------------|
| (1) Green plants     | (2) Dead organic matter |
| (3) Both (1) and (2) | (4) None of the above   |
70. Agenda of Kyoto protocol is :
- (1) Control of ozone depletion
  - (2) Regulation of hazardous waste
  - (3) Control the source of greenhouse gases
  - (4) None of the above



71. Ozone layer present in :

- (1) Stratosphere
- (2) Troposphere
- (3) Mesosphere
- (4) Thermosphere

72. Bioaugmentation involves :

- (1) Eliminating sludge
- (2) Plants usage for bioremediation
- (3) Addition of microbes to a cleanup site
- (4) Bioventing

73. Which one of the following is related to ex situ conservation of threatened animals and plants ?

- (1) Amazon rain forest
- (2) Himalayan region
- (3) Wildlife safari park
- (4) Biodiversity hotspots

74. Which one is green manure/biofertilizer ?

- (1) Sesbania
- (2) Rice
- (3) Oat
- (4) Maize

75. Which of the following is not used as a biopesticide ?

- (1) *Trichoderma harzianum*
- (2) *Nucleopolyhedrovirus*
- (3) *Xanthomonas campestris*
- (4) *Bacillus thuringiensis*

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76. A woman with two genes for haemophilia and a gene for colour blindness on one of the X chromosomes marries a normal man. How will be the progeny ?
- (1) Haemophilic and colour blind daughters
  - (2) All sons and daughters haemophilic and colourblind
  - (3) 50% haemophilic colourblind sons and 50% normal sons
  - (4) 50% haemophilic daughters and 50% colourblind daughters
77. When we cross red flowered variety of *Mirabilis jalapa* with white flowered variety we get pink flowers. This is called :
- (1) Complete dominance
  - (2) Incomplete dominance
  - (3) Co dominance
  - (4) Epistasis
78. Mutation is generally due to :
- (1) Lethal gene
  - (2) Dominant gene
  - (3) Recessive gene
  - (4) Complementary gene
79. Tetrad analysis in *Neurospora* confirms that crossing over occurs at :
- (1) Single stranded stage
  - (2) 2-stranded stage
  - (3) 3-stranded stage
  - (4) 4-stranded stage
80. Cytoplasmic male sterility in Maize is manifestation of interaction between :
- (1) Chloroplast and Nuclear genes
  - (2) Mitochondrial and Nuclear genes
  - (3) Chloroplast and mitochondrial genes
  - (4) Cytoplasmic factors and male sterile genes

81. During EMP pathway, the ATP is produced through :
- (1) Oxidative phosphorylation
  - (2) Cyclic phosphorylation
  - (3) Substrate level phosphorylation
  - (4) None of the above
82.  $C_4$  plants are similar to  $C_3$  plants in having :
- (1) Kranz anatomy
  - (2)  $C_3$  pathway of  $CO_2$  fixation
  - (3) Dimorphic chloroplasts
  - (4) High  $CO_2$  compensation point
83. Enzymes concerned with ammonia assimilation is :
- |                 |                          |
|-----------------|--------------------------|
| (1) Nitrogenase | (2) Arginase             |
| (3) Urease      | (4) Glutamine synthetase |
84. Under water stress conditions which of the following does not increase in leaves ?
- |             |                       |
|-------------|-----------------------|
| (1) Betaine | (2) ABA               |
| (3) Proline | (4) Nitrate reductase |
85. RFLP study is a technique for :
- (1) Transferring genes from unrelated species
  - (2) Isolating a single gene
  - (3) Isolating single gene product
  - (4) Identifying genetic (DNA) homologies

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86. Genetically engineered male sterile crop plants have been produced by involving :
- (1) Opaque 2 gene
  - (2) Virus coat protein genes
  - (3) Barnase gene
  - (4) Chitinase gene
87. The essential component of Ti Plasmid required for transfer and integration of T DNA into the plant genome is :
- (1) Origin of replication
  - (2) Virulence genes
  - (3) Nopaline utilization gene
  - (4) All of the above
88. Artificial seeds are produced by :
- (1) Immobilization of somatic embryos
  - (2) Biotransformation
  - (3) Biosynthesis
  - (4) Enzymatic isolation
89. Which cell line is used to produce recombinant sex hormones ?
- (1) HELA cell line
  - (2) VERO cell line
  - (3) CHO cell line
  - (4) BHK cell line
90. The technique used in animal biotechnology for the rapid multiplication and production of animals with a desirable genotype is :
- (1) Protoplast Fusion and Embryo Transfer
  - (2) Hybrid Selection and Embryo Transfer
  - (3) In Vitro Fertilization and Embryo Transfer
  - (4) All of the above



91. Animal cell cultures are used widely for the production of :
- (1) Insulin (2) Somatostatin  
(3) MABS (4) Thyroxine
92. The virus commonly used to infect cell cultures for the production of interferon is :
- (1) Corona virus (2) Sendai virus  
(3) Polio virus (4) Smallpox virus
93. Which of the following is the structural fiber in a cell cultural system ?
- (1) Collagen (2) Elastin  
(3) Fibronectin (4) Both (1) and (2)
94. Which of the following media is used for the maturation of oocytes ?
- (1) DMEM (2) TCM-199  
(3) Ham's F-10 (4) Both (2) and (3)
95. In ICSI the sperm is injected in :
- (1) Nucleoplasm (2) Cytoplasm  
(3) Perivitelline space (4) None
96. The HAT medium used for the selection of fused hybrid cells in hybridoma culture was introduced by :
- (1) Littlefield and Miller (2) Kohler and Milstein  
(3) Frish and Jentoft (4) Eagle and Karle

97. Match the Columns :

Column-I	Column-II
(A) Rosie	(i) $\alpha$ -I antitrypsin
(B) ROP	(ii) Protein-enriched milk
(C) Emphysema	(iii) Test to detect antigen or antibody
(D) ELISA	(iv) Codes for a protein involved in plasmid replication
(1) A-ii, B-iii, C-iv, D-i	(2) A-i, B-iii, C-iv, D-ii
(3) A-ii, B-iv, C-i, D-iii	(4) A-i, B-iv, C-ii, D-iii

98. If  $\Delta G^\circ$  of the reaction  $A \rightarrow B$  is  $-40\text{kJ/mol}$  under standard conditions then the reaction :

- (1) Will never reach equilibrium
- (2) Will proceed from left to right
- (3) Will not occur spontaneously
- (4) Will proceed from right to left

99. A widely used technique for cell disruption is :

- |                          |                                  |
|--------------------------|----------------------------------|
| (1) High-speed agitation | (2) Osmotic Shock                |
| (3) Grinding             | (4) High-pressure homogenisation |

100. If one starts with 10,000 ( $10^4$ ) cells in a culture that has a generation time of 2 hours, how many cells will be in the culture after 4 and 48 hours ?

- (1)  $4.0 \times 10^4$  cells,  $1.7 \times 10^{11}$  cells
- (2)  $4.2 \times 10^4$  cells,  $1.1 \times 10^{11}$  cells
- (3)  $4.6 \times 10^4$  cells,  $1.5 \times 10^{11}$  cells
- (4)  $4.8 \times 10^4$  cells,  $1.3 \times 10^{11}$  cells



ANSWER KEYS OF BIO TECH UIET FOR SESSION 2022-23				
Q. NO.	A	B	C	D
1	3	3	2	2
2	2	3	2	1
3	4	2	1	4
4	4	4	1	3
5	4	3	3	1
6	3	2	3	4
7	2	4	1	1
8	1	2	2	1
9	3	2	4	4
10	3	3	1	2
11	3	1	1	3
12	2	3	3	2
13	4	1	3	2
14	4	4	1	3
15	2	3	3	4
16	1	4	3	2
17	3	1	2	4
18	2	3	3	3
19	4	1	4	3
20	1	2	4	3
21	2	2	1	1
22	2	1	1	3
23	1	4	4	1
24	1	3	2	4
25	3	1	3	3
26	3	4	3	4
27	1	1	3	1
28	2	1	3	3
29	4	4	2	1
30	1	2	2	2
31	3	3	1	2
32	2	2	3	2
33	2	4	1	1
34	3	4	4	1
35	4	4	3	3
36	2	3	4	3
37	4	2	1	1
38	3	1	3	2
39	3	3	1	4
40	3	3	2	1
41	3	1	3	1
42	3	3	2	1
43	2	3	4	1
44	4	1	4	3
45	3	3	2	4
46	2	3	1	1
47	4	2	3	3
48	2	3	2	2
49	2	4	4	1
50	3	4	1	2

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... 14.12.2022

ANSWER KEYS OF BIO TECH UIET FOR SESSION 2022-23				
Q. NO.	A	B	C	D
51	1	1	3	1
52	3	1	2	1
53	3	1	2	4
54	1	3	3	2
55	3	4	4	3
56	3	1	2	3
57	2	3	4	3
58	3	2	3	3
59	4	1	3	2
60	4	2	3	2
61	1	2	3	3
62	1	2	2	3
63	1	1	4	2
64	3	1	4	4
65	4	3	4	3
66	1	3	3	2
67	3	1	2	4
68	2	2	1	2
69	1	4	3	2
70	2	1	3	3
71	1	3	3	1
72	3	2	3	3
73	1	4	2	3
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79	1	4	2	4
80	2	1	3	4
81	1	1	2	3
82	1	1	1	2
83	4	4	4	4
84	2	2	3	4
85	3	3	1	4
86	3	3	4	3
87	3	3	1	2
88	3	3	1	1
89	2	2	4	3
90	2	2	2	3
91	2	3	1	3
92	1	2	1	2
93	4	2	1	4
94	3	3	3	4
95	1	4	4	2
96	4	2	1	1
97	1	4	3	3
98	1	3	2	2
99	4	3	1	4
100	2	3	2	1

*M. Hing*

*Done*  
14.12.2022