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**D**

**SET-Y**

**M.Phil./Ph.D./URS-EE-2019**

**SUBJECT : Life Science**

Sr. No. 10152

Time : 1¼ Hours

Max. Marks : 100

Total Questions : 100

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

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

Mother's Name \_\_\_\_\_ Date of Examination \_\_\_\_\_

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1. In a population that is in equilibrium, the proportion of individuals showing the dominant trait at a given locus having two alleles is 84%. The frequency of the recessive allele in the population is :  
(1) 0.4                      (2) 0.32                      (3) 0.16                      (4) 0.8
2. Antibiotics are typically produced in fed batch reactors because :  
(1) antibiotic yields are generally higher when cells enter the stationary phase  
(2) the precursors are often toxic to the cells  
(3) antibiotic yields are generally higher when cell growth slows  
(4) 1, 2, 3
3. How does CO<sub>2</sub> help in the cell metabolism during cell culture ?  
(1) It participates in the de novo synthesis of purines and pyrimidines  
(2) Helps in the cells respiration  
(3) For monitoring pH of the culture  
(4) (2) and (1)
4. In case of Baculoviruses, the foreign gene :  
(1) is inserted downstream of polyhedrin promoter  
(2) is inserted downstream of viral origin of replication  
(3) is inserted between the polyhedrin promoter and downstream sequences  
(4) is inserted upstream of viral origin of replication
5. A purified DNA sample of leaf contains 20.0 mole of guanine. Calculate the approximate percentage of purine residues ?  
(1) 30%                      (2) 40%                      (3) 60%                      (4) 20%
6. What are protamines ?  
(1) Large size DNA  
(2) Sequences that are unique  
(3) Histone like protein found in fish sperm  
(4) Highly repetitive DNA
7. Name the protein, which maintained the condensed structure of chromosomes.  
(1) HSP                      (2) SMC                      (3) Collagen                      (4) Elastin
8. Name the effect which shows the change in expression of alleles of the gene due to a specific environmental condition.  
(1) Pleiotropy                      (2) Linkage                      (3) Phenocopy                      (4) Penetrance

9. What is tautonym ?  
(1) These are the repeated sequences (2) It is a name of fish  
(3) Identical name of genus and species (4) It is a name of the genus
10. Identify the disease which causes excessive production of uric acid.  
(1) Duncan muscular dystrophy (2) Lesch-Nyhan syndrome  
(3) Hunter syndrome (4) Hemophilia
11. Which of the following statements is false ?  
(1) Continuous variation produces a spread of variation within a population  
(2) Discontinuous variation is the result of genetics alone  
(3) Blood group is an example of discontinuous variation  
(4) Discontinuous variation is influenced by the environment
12. Karyoplast is :  
(1) cells devoid of cell wall  
(2) nuclei  
(3) nuclei with only some residual plasma membrane  
(4) cell with nucleus
13. Which of the following is used to check vortex and to improve aeration efficiency in a fermentor ?  
(1) Impeller (2) Baffles (3) Sparger (4) Both (1) and (2)
14. Which of the following microorganisms help in the ethanol production ?  
(1) *Saccharomyces cerevisiae* (2) *Zygomonas mobilis*  
(3) *Saccharomyces uvarum* (4) 1, 2, 3
15. In animal cell culture, particularly mammalian cell culture, transformation means :  
(1) uptake of new genetic material  
(2) phenotypic modifications of cells in culture  
(3) both (1) and (2)  
(4) release of genetic information
16. Cells which have undergone transformation frequently become :  
(1) anchorage independent (2) anchorage dependent  
(3) stable (4) unstable

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17. The ability of the component cells of callus to form a whole plant is known as :  
(1) redifferentiation (2) dedifferentiation  
(3) either (1) or (2) (4) Regeneration
18. Inundation involves use of a/an :  
(1) large number of organisms over a short time to suppress/destroy a population  
(2) organism over a short time to suppress/destroy a population  
(3) large number of organisms over a long time to suppress/destroy a population  
(4) organism over a long time to suppress/destroy a population
19. The heavily polluted zone of water reservoir is known as :  
(1) pleosaprophytic zone (2) mesosaprophytic zone  
(3) Sclerosaprophytic zone (4) Micosaprophytic zone
20. Which of the following is selectively effective against dicot weeds ?  
(1) Cycloheximide (2) Anisomycin  
(3) Herbicidin (1) and (2) (4) Both (2) and (3)
21. Name the regulatory component of the cell cycle :  
(1) Cyclin (2) CDK (3) DNA (4) APC
22. What is the origin of the cancerous cells ?  
(1) Monoclonal (2) Polyclonal (3) Stem cells (4) Mesodermal cells
23. Name the group of species which exploit the abiotic and biotic resources in a similar way ?  
(1) Guild (2) Ecads (3) Biomes (4) Community
24. Two genes are 70cM apart, calculate the recombination frequency ?  
(1) 50% (2) 100% (3) 25% (4) 70%
25. What is a petite mutant ?  
(1) Defective mitochondrial function of yeast  
(2) Plastid function mutant  
(3) Dwarfism  
(4) Maternal effect genes
26. Which of the following chromosomal aberration shows pseudodominance ?  
(1) Deletion (2) Duplication (3) Inversions (4) Translocation
27. Which of the following compounds is NOT found in tears ?  
(1) Lysozyme (2) Lactoferin (3) IgA (4) IgE

28. Name the group of pattern recognition molecules which functions exclusively as a signaling receptor ?  
(1) eRP (2) Toll-like receptor  
(3) MBL (4) LPS
29. Name the nerve stimulator which is responsible for the pain of the inflammation.  
(1) Bradikinins (2) Prostaglandin (3) Histamines (4) Kinins
30. Which of the following phylum has a water vascular system ?  
(1) Plantae (2) Mollusca (3) Echinodermata (4) Hemichordata
31. Which one of the following techniques is used demonstrate the presence of DNase - sensitive sites in euchromatin ?  
(1) Automated DNA sequencing (2) Southern blot analysis  
(3) Northern blot analysis (4) DNA fingerprinting
32. In the yeast two hybrid-technology, the bait domain forms a non-covalent association with :  
(1) The activation domain of a transcription activator  
(2) The DNA binding domain of a transcription activator  
(3) Reporter gene products  
(4) An unknown interacting protein
33. Messenger RNAs were not visible as discrete bands in your RNA gel because  
(1) The concentration of rRNA was too high  
(2) The molecular weight of mRNAs varies tremendously  
(3) mRNAs are much less stable than rRNAs.  
(4) mRNAs were not extracted
34. What is the name of the region between the start site of transcription and the first ATG ?  
(1) Promoter (2) 3' untranslated region  
(3) Start site for translation (4) 5' untranslated region
35. What happens when tryptophan levels are high in bacteria ?  
(1) Some transcription of the 5'end of the trp operon occurs  
(2) The trp repressor protein is tetramer that contains 4 molecules of trp  
(3) The binding of trp decreases the affinity of the trp repressor for the operator  
(4) Translation of the leader peptide is terminated

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36. What component is not involved in mRNA splicing ?
- (1) 28 rRNA
  - (2) Consensus sequence at the 5' and 3' ends of the introns
  - (3) 2'OH group of the ribose sugar at splice site
  - (4) Spliceosome
37. Which tropical fruit crop has been successfully engineered to be protected against a lethal virus ?
- (1) Passion fruit      (2) Papaya      (3) Mango      (4) Guava
38. Which of the following fatty acids has the lowest melting point ?
- (1) fatty acids with sites of unsaturation with cis double bonds
  - (2) fatty acids with sites of unsaturation with trans double bonds
  - (3) fatty acids with no sites of unsaturation
  - (4) fatty acids with longer hydrophobic tails
39. Which of the following gene have been introduced into the transgenic fish ?
- (1) Human or rat gene for growth hormone
  - (2) Chicken gene for delta crystalline protein
  - (3) E. coli gene for  $\beta$ -galactosidase
  - (4) 1, 2, 3
40. DNA is microinjected into the fertilized egg :
- (1) after the fusion of male and female nuclei
  - (2) before the fusion of male and female nuclei
  - (3) at the time of fusion of male and female nuclei
  - (4) Both (2) and (3)
41. miRNAs :
- P- are synthesized as long pri-miRNAs (up to 1000 nt)
- Q.- are transcribed by RNA polymerase II
- R.- are synthesized from pre-miRNAs by an RNase III enzyme drosha in the cytoplasm
- S- are synthesized from pri-miRNAs by an enzyme dicer in the nucleus
- (1) P and Q
  - (2) Q and S
  - (3) P and S
  - (4) R and S

42. The primer of the lagging strand during DNA replication is removed by :
- (1) 3' to 5' exonuclease activity of DNA pol III
  - (2) DNA primase
  - (3) 5' to 3' exonuclease activity of DNA pol I
  - (4) 3' to 5' exonuclease activity of DNA pol I
43. A restriction endonuclease has the recognition sequence G/AATTC, where "I" indicates the cut site. This sequence is found, on average, once every 'x' residues in a chromosome. 'x' =
- (1) 146 base-pairs
  - (2) 200 base-pairs
  - (3) 256 base-pairs
  - (4) 4096 base-pairs
44. An allosteric activator :
- (1) increases the binding affinity
  - (2) decreases the binding affinity
  - (3) stabilizes the R state of the protein
  - (4) both (1) and (3)
45. IP<sub>3</sub> initially causes Ca<sup>2+</sup> to be released into the cytoplasm from :
- (1) mitochondria
  - (2) lysosome
  - (3) the endoplasmic reticulum
  - (4) the plasma membrane (from extracellular to intracellular)
46. A protein that binds two ligands in a non-cooperative manner will show :
- (1) sigmoidal binding curve
  - (2) a hyperbolic binding curve
  - (3) a linear Scatchard Plot
  - (4) both (2) and (3)
47. Why do fluorescence spectrometers often use double-beam optics ?
- (1) So a reference solution can be used
  - (2) To compensate for beam attenuation by the monochromator
  - (3) To compensate for power fluctuations in the radiation source
  - (4) (2) and (3)
48. The nucleophile in serine proteases is :
- (1) Serine
  - (2) water
  - (3) both (1) and (2)
  - (4) Asparagine
49. What is shielding in NMR ?
- (1) Using a curved piece of metal to block an opponent's attack
  - (2) Putting metal around an Rf source
  - (3) When the magnetic moment of an atom blocks the full induced magnetic field from surrounding nuclei
  - (4) Blocking parts of a molecule from Rf radiation

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50. Column efficiency is measured in terms of number of plates which is :
- (1) inversely related to the square of the peak width
  - (2) directly related to the square of the peak width
  - (3) inversely related to the cube root of the peak width
  - (4) directly related to the square of the peak width
51. Which of the following class of algae consists of alginic acid in their cell wall component ?
- (1) Green algae
  - (2) Red algae
  - (3) Lichens
  - (4) Brown algae
52. Which of the following spores is motile in nature ?
- (1) Zoospores
  - (2) Oomycetes
  - (3) Aplanospores
  - (4) Hepdnaspores
53. What is the standard free energy change of ATP ?
- (1) Small and negative
  - (2) Large and positive
  - (3) Large and negative
  - (4) Small and positive
54. Which of the following act as a storage form of high energy phosphate ?
- (1) Glucose-6-phosphate
  - (2) Phosphoenolpyruvate
  - (3) Phosphagens
  - (4) Glycerol phosphate
55. Name the term which is used for the water present in the soil that can be utilized by the plants.
- (1) Chresard
  - (2) Humus
  - (3) Gravitational water
  - (4) Capillary water
56. What is the entropy of the early succession community ?
- (1) Medium
  - (2) Low
  - (3) High
  - (4) Very high
57. Name the type of community which is maintained by the man or his domestic animals.
- (1) Climatic
  - (2) Edaphic
  - (3) Disclimax
  - (4) Subclimax
58. Name the repair system for UV mediated damage of DNA.
- (1) Exchange of homologous segments
  - (2) DNA glycosylase
  - (3) Nucleotide excision repair
  - (4) Photoreactivation
59. Genes related through descent from a common ancestral gene are called :
- (1) Orthologous
  - (2) Homologous
  - (3) Heterologous
  - (4) Paralogous



60. Which of the following are correct ?  
(1) classical Mendelian traits are qualitative in nature  
(2) qualitative traits show discontinuous variations  
(3) qualitative traits are referred to as metric traits  
(4) Both (1) and (2)
61. Which of the following accumulates from factory waste ?  
(1) *Pseudomonas aeruginosa* (2) *Thiobacillus*  
(3) *Pseudomonas putida* (4) *Zoogloeara*
62. The phospholipids present in cytoplasm membrane of the archaeo-bacteria is :  
(1) phosphoglycerides (2) polyisoprenoid  
(3) polyisoprenoid branched chain lipids (4) lecithin
63. Which were the investigators lived at the same time ?  
(1) Koch and Pasteur (2) Darwin and Woese  
(3) Van Leeuwenhoek and Ricketts (4) Berg and Hooke
64. Large parasites such as helminthes may be killed extracellularly by the action of :  
(1) basophils (2) monocytes  
(3) eosinophils (4) Macrophages
65. Which of the following is correct for CD8 T cells ?  
(1) CD8 T cells only recognize virus-infected cells  
(2) CD8 T cell receptor recognizes epitopes that are also commonly recognized by B cells  
(3) In the thymus, CD8 T cells undergo positive selection only, whereas CD4 T cells undergo negative selection only  
(4) Both (2) and (3)
66. Passive immunization is done for :  
(1) tuberculosis (2) diphtheria  
(3) Measles (4) Mumps
67. Major Histo Compatibility Complex (MHC) is a collection of genes arrayed on :  
(1) chromosome 21 in man, chromosome 6 in mice  
(2) chromosome 6 in man, chromosome 21 in mice  
(3) chromosome 17 in man, chromosome 6 in mice  
(4) chromosome 6 in man, chromosome 17 in mice

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68. Which one is a small laboratory set up to simulate conditions of a particular environment ?
- (1) microcosm- (2) mibridization  
(3) bioremediation (4) rhizosecretion
69. Transplastomics :
- (1) targets genes in the chloroplast  
(2) provides exceptionally low yields of protein products  
(3) produces genes that are released in pollen  
(4) offers little opportunity for practical use
70. In an  $\alpha$ -helix hydrogen bonds are :
- (1) within a single chain  
(2) between chains that run side by side  
(3) between polar amino acid and water  
(4) only between amino acids of opposite charge
71. Glycogen is a branched polymer of glucose. It has :
- (1) no reducing ends  
(2) no non-reducing ends  
(3) one reducing end and several non-reducing ends  
(4) one non-reducing end and several reducing ends
72. Codon bias can be overcome by which scenario?.
- (1) Genetically engineering host organisms to express rarer tRNAs  
(2) Genetically engineering the gene so that the codons are recognized by more abundant tRNAs  
(3) Genetically engineer the gene to remove the codons for rare tRNAs  
(4) Both (1) and (2) are suitable scenarios.
73. Why are gene libraries constructed ?
- (1) To find new genes.  
(2) To compare genes to other organism.  
(3) To create a "bank" of all the genes in an organism.  
(4) All of the above.
74. Which property is measured with a scanning microscope ?
- (1) Magnetism (2) Electric resistance  
(3) Light absorption (4) All of the above

75. Which agency is responsible for regulation of all transgenic technology ?  
(1) FDA (2) EPA  
(3) NIH (4) All of the above
76. Which of the following introduce mutations in plant genes ?  
(1) TILLING (2) Transposon insertions  
(3) RNAi (4) All of the above
77. Which ion channel is defective in people with cystic fibrosis ?  
(1) Sodium transporter (2) Potassium transporter  
(3) Chloride transporter (4) Calcium transporter
78. Which of the following molecular techniques can be used to identify pathogens ?  
(1) DNA sequencing (2) Ribotyping  
(3) RAPD (4) All of the above
79. How do prions cause disease ?  
(1) Prion proteins bind to cells and induce apoptosis.  
(2) Prion proteins bind to DNA polymerase and prevent replication  
(3) Prion proteins induce normal cellular proteins to refold into the prion form.  
(4) Prion proteins induce an immune response against the "self".
80. The Alu element found in the human genome is :  
(1) A 7S L scRNA homologue  
(2) A good RNA polymerase III template  
(3) About 300 bp long repeat  
(4) All of the above
81. Name the plant in which auxin was first discovered :  
(1) Muatard (2) Oats (3) Rice (4) Pea
82. Human placenta is derived from :  
(1) Allantois (2) Chorion (3) Amnion (4) Allantois and Chorion
83. Which of the following is a large ribozyme ?  
(1) Hairpin ribozyme (2) Hammerhead ribozyme  
(3) Twort ribozyme (4) Hepatitis delta virus
84. Which cellular component is considered to be a nano(assembler) ?  
(1) Chromatin (2) Ribosomes (3) DNA (4) mRNA

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85. What is contig mapping ?  
(1) Determination of regions that overlap from one place to the next in a library  
(2) The distance in base pairs between two markers  
(3) The use of landmarks in the genes to put together sequencing data  
(4) The relative order of specific markers in a genome
86. Which one of the following is often used to establish family trees for organisms it is present in all organisms and does not accumulate mutations quickly ?  
(1) rRNA (2) Fibrinopeptides (3) Hemoglobin (4) Mitochondrial DNA
87. Which of the following is used to quantify proteins with mass spectroscopy ?  
(1) 2H (2) 33P (3) 35S (4) 125I
88. What could be used to increase the stability and purification of eukaryotic proteins from bacterial cells?  
(1) A peptide tag (2) A protein fusion  
(3) PEST sequence (4) A signal sequence
89. What term describes the process of creating random mutations in a gene and then selecting for improved functions or altered specificity of the resulting protein product ?  
(1) Indirect evolution (2) Protein mutagenesis  
(3) Translational evolution (4) Directed evolution
90. Which enzyme described in the book had significantly increased clinical activity after engineering more glycosylation sites into the protein ?  
(1) Erythropoietin (2) Calmodulin  
(3) Insulin (4) Glucose isomerase
91. Which method is better suited for the identification of actively growing bacteria or viruses ?  
(1) BrdU- enrichment  
(2) Suppressive subtraction hybridization  
(3) Stable isotope probing  
(4) DNA sequencing
92. Which genera of microorganisms have the most diverse pathways for bioremediation ?  
(1) Mycobacterium (2) Pseudomonas (3) Rhodococcus (4) Methylobium
93. What is DNA coated onto when transforming plant cells with a particle gun ?  
(1) Silver (2) Aluminium (3) Gold (4) Calcium



94. During DNA polymerase reaction the nucleophile is the :
- (1) 3'OH group of the nucleotide at the 3' end
  - (2) 3'OH group of the nucleotide at the 5'end
  - (3) 5'OH group of the nucleotide at the 5'end
  - (4) 5'OH group of the nucleotide at the 3'end
95. Which of the following statements concerning protein synthesis is correct ?
- (1) EF-Tu is involved in the recognition and binding of the START codon
  - (2) Release factors are not tRNAs but proteins that recognize STOP codons
  - (3) A ribosomal protein provides the enzymatic activity of peptidyltransferase
  - (4) EF-Tu and EF-G are used in eukaryotes
96. Wobble pairing occurs between :
- (1) 1<sup>st</sup> nucleotide of codon and 3<sup>rd</sup> nucleotide of anticodon
  - (2) 1<sup>st</sup> nucleotide of anticodon and 3<sup>rd</sup> nucleotide of codon
  - (3) 3<sup>rd</sup> nucleotide of codon and 1<sup>st</sup> nucleotide of anticodon
  - (4) 3<sup>rd</sup> nucleotide of anticodon and 1<sup>st</sup> nucleotide of codon
97. An ultraviolet spectrophotometer can be used to measure the concentration and purity of DNA or RNA. This is because :
- (1) The absorption spectrum for DNA or RNA is triphasic
  - (2) Purines and pyrimidines absorb ultraviolet light
  - (3) Boyle's law provides the concentration as long as path length is known
  - (4) Nucleic acids emit fluorescent light when activated with ultraviolet light
98. The E.coli genome is typical of many prokaryotic genomes. Which of the following statements is correct ?
- (1) All transcriptional units are transcribed in a clockwise direction
  - (2) The E. Coligenome codes for antibiotic resistance genes
  - (3) The protein coding potential of prokaryotic genomes correlates with their C-values
  - (4) Prokaryotic genomes do not code for monocistronic mRNAs
99. High salt concentrations were used in the DNA isolation and the RNA isolation laboratories to :
- (1) Degrade histones
  - (2) Buffer the solutions
  - (3) Prevent nucleic acids degradation
  - (4) Promote nucleic acid precipitation
100. Proteins have the same molecular mass and have identical net charge at pH 7. The best way to separate them would be to use :
- (1) SDS- polyacrylamide gel electrophoresis
  - (2) native gel electrophoresis
  - (3) cation exchange chromatography
  - (4) anion exchange chromatography

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