VINAYAKA MISSION'S RESEARCH FOUNDATION, SALEM

(Deemed to be University under section 3 of the UGC Act 1956)

Ph.D Entrance Test – November – 2025

Faculty of Engineering & Technology

Biotechnology

Instructions / Note:

1. Answer all the questions. Each question carries one mark.
2. No negative marks for wrong answers.
3. Read each question carefully and answer in the OMR sheet provided for each question with only blue/ black pen to fill the circles in the OMR Sheet.
4. Question number 1 - 35 questions belong to Research Methodology component and Question number 36-70 questions belong to the subject at PG level
5. Return the question paper along with the OMR sheet.

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36. Which enzyme unwinds the DNA helix during replication?
    A. DNA ligase
    B. DNA helicase
    C. Topoisomerase I
    D. RNA polymerase

37. In prokaryotes, transcription and translation are coupled because _____
    A. Both occur in the nucleus
    B. Ribosomes bind to mRNA as it is being transcribed
    C. They use different enzymes
    D. Transcription occurs after translation

38. The lac operon is induced in the presence of _____
    A. Glucose
    B. Lactose
    C. Both glucose and lactose
    D. Absence of camp

39. Which DNA-repair mechanism removes bulky lesions such as thymine dimers?
    A. Base-excision repair
    B. Nucleotide-excision repair
    C. Mismatch repair
    D. Recombination repair

40. RNA splicing removes _____
    A. Exons
    B. Introns
    C. Promoters
    D. Enhancers

41. DNA polymerase I from E. coli possesses which of the following activities?
    A. 5′→3′ polymerase only
    B. 5′→3′ polymerase and 3′→5′ exonuclease
    C. 3′→5′ polymerase only
    D. 5′→3′ polymerase and 5′→3′ exonuclease

42. A plasmid vector carrying an antibiotic resistance gene helps in _____
    A. Screening for transformed cells
    B. Enhancing replication speed
    C. Gene silencing
    D. Mutagenesis

43. Which enzyme joins Okazaki fragments during DNA replication?
    A. DNA polymerase III
    B. DNA ligase
    C. Helicase
    D. Primase

44. The Ti-plasmid of Agrobacterium tumefaciens is widely used because it _____
    A. Transfers genes into animal cells
    B. Carries oncogenes
    C. Acts as a natural plant gene transfer system
    D. Synthesizes proteins in bacteria

45. The polymerase chain reaction (PCR) requires all except _____
    A. Template DNA
    B. DNA ligase
    C. Primers
    D. Taq polymerase

46. Which vector is used for cloning large DNA fragments (up to 300 kb)?
    A. Plasmid
    B. BAC
    C. Cosmid
    D. YAC

47. Monoclonal antibodies are produced by _____
    A. Hybridoma technology
    B. Cloning lymphocytes
    C. Phage display only
    D. Somatic hybridization

48. The goal of gene therapy is to _____
    A. Suppress immune response
    B. Correct defective genes responsible for disease
    C. Induce mutation
    D. Enhance enzyme activity

49. Which of the following is used in the production of recombinant insulin?
    A. E. coli
    B. Bacillus subtilis
    C. Aspergillus niger
    D. Rhizobium sp

50. Stem cells that can give rise to all cell types are called _____
    A. Multipotent
    B. Unipotent
    C. Totipotent
    D. Progenitor

51. The Km value in enzyme kinetics represents _____
    A. Maximum velocity
    B. Substrate concentration at half Vmax
    C. Inhibitor constant
    D. Enzyme concentration

52. A non-competitive inhibitor _____
    A. Binds to the active site
    B. Decreases Vmax without changing Km
    C. Increases both Km and Vmax
    D. Competes with substrate

53. Allosteric enzymes exhibit _____
    A. Michaelis–Menten kinetics
    B. Sigmoidal kinetics
    C. Zero-order kinetics
    D. No regulation

54. Enzymes used in detergent formulations are mainly _____
    A. Proteases
    B. Amylases
    C. Lipases
    D. All of these

55. The α-helix and β-sheet structures of proteins are stabilized by _____
    A. Hydrogen bonds
    B. Disulfide bonds
    C. Ionic bonds
    D. Peptide bonds

56. The first antibody produced after exposure to an antigen is _____
    A. IgA
    B. IgM
    C. IgG
    D. IgE

57. The process by which immune cells engulf and destroy pathogens is called _____
    A. Apoptosis
    B. Opsonization
    C. Phagocytosis
    D. Complement fixation

58. Which cells mediate cell-mediated immunity?
    A. B-lymphocytes
    B. Helper T-cells
    C. Cytotoxic T-cells
    D. Macrophages

59. A vaccine prepared using a non-infectious component of a pathogen is called _____
    A. Live attenuated vaccine
    B. Subunit vaccine
    C. DNA vaccine
    D. Recombinant vector vaccine

60. The "Booster Dose" in vaccination is meant to _____
    A. Reduce side effects
    B. Enhance immune memory
    C. Induce tolerance
    D. Suppress antibodies

61. FASTA and BLAST are used for _____
    A. Protein folding
    B. Sequence alignment and similarity searches
    C. Pathway simulation
    D. Structure prediction

62. A database providing protein 3D structures is _____
    A. GenBank
    B. PDB
    C. UniProt
    D. Ensembl

63. Which technology enables simultaneous measurement of thousands of gene expressions?
    A. PCR
    B. DNA microarray
    C. Southern blotting
    D. ELISA

64. Gene Ontology (GO) classifies genes based on _____
    A. Sequence length
    B. Molecular function, biological process and cellular component
    C. Organism origin
    D. 3D structure

65. Metagenomics involves _____
    A. Sequencing of environmental DNA to study microbial communities
    B. Protein modeling
    C. Vaccine design
    D. Cell culture

66. Systems biology mainly aims to _____
    A. Analyze isolated genes
    B. Understand interactions within biological networks
    C. Model chemical reactions
    D. Study individual proteins only

67. Comparative genomics helps in _____
    A. Finding gene orthologs across species
    B. Predicting protein folding
    C. Estimating mutation rates
    D. Analyzing lipid pathways

68. NGS platforms differ from Sanger sequencing mainly in _____
    A. Read length only
    B. Throughput and parallel sequencing capability
    C. Use of fluorescent dyes
    D. Template requirements

69. Synthetic biology combines _____
    A. Computer science and biochemistry
    B. Engineering principles with biology to design new systems
    C. Protein folding and denaturation
    D. Structural genomics only

70. The goal of metabolic pathway modeling is to _____
    A. Visualize metabolite transport
    B. Quantitatively simulate and predict cellular behavior
    C. Identify mutations
    D. Perform microbial culturing