

ALAGAPPA UNIVERSITY

**DBT Sponsored One Year Post M. Sc., Advanced Diploma Course in  
Molecular Diagnostics**

**Entrance Examination –2009**

**Reg. No.....**

**Signature of the Invigilators**

**Exam Centre.....**

**1.....**

**2. ....**

**Time: Two Hours**

**Maximum: 100 Marks**

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**INSTRUCTIONS TO CANDIDATES**

**Candidates must read carefully the following instructions  
before attempting to answer any question**

- (i) Correct answer will carry 1 mark each.**
- (ii) The question paper consists of 100 Objective Type Questions. Answer ALL the 100 questions in Unit I to Unit V on the OMR sheet provided for this purpose. Use HB pencil or Ballpoint pen for shading.**
- (iii) Simple calculators and Log Tables can be used.**
- (iv) The last two pages can be used for rough work.**
- (v) Write the Registration Number in the space provided for the purpose.**

**Answer ALL the Questions**

**(100 x 1 = 100 marks)**

1. X-gal is used to the selection of transferred cells because
  - a) its an inert material
  - b) it is a synthetic galactose
  - c) It is a reagent
  - d) it is a synthetic galactose acting as an indicator
  
2. In prokaryotes the lagging primers are removed by 3'-5' exonuclease of
  - a) DNA ligase
  - b) DNA polymerase I
  - c) DNA polymerase III
  - d) None of the Above
  
3. The essential initiator protein at the *E. coli* origin of replication is
  - a) DnaA
  - b) DnaB
  - c) DnaC
  - d) DnaE
  
4. Eukaryotic final equivalent of prokaryotic 16S rRNA is the
  - a) 5S rRNA
  - b) 16S rRNA
  - c) 18S rRNA
  - d) 23S rRNA
  
5. Palindromic sequences are
  - a) DNA sequence with a twofold rotational axis of symmetry
  - b) similar sequences
  - c) dissimilar sequences
  - d) none of the above
  
6. Okazaki fragments
  - a) require the activity of only a DNA polymerase for synthesis
  - b) require only RNA polymerase activity for synthesis
  - c) are made when DNA is exposed to UV radiation
  - d) are composed of both DNA and RNA
  
7. During DNA replication the strands are unwounded by
  - a) Gyrase
  - b) topoisomerase
  - c) helicase
  - d) ligase

8. Which one of the following is an inhibitor of bacterial transcription

- a) Streptomycin
- b) Kanamycin
- c) Rifampicin
- d) Nalidixic acid

9. A single primer is used in

- a) Nested PCR
- b) RAPD
- c) Symmetric PCR
- d) Hot Start PCR

10. Genes whose products are constantly needed for cellular activity are called

- a) regulator genes
- b) structural genes
- c) house keeping genes
- d) smart gene

11. The hypothesis that the total amount of purines always equal to the amount of pyrimidines was proposed by

- a) Watson and Crick
- b) Chargaff
- c) Roselin and Franklin
- d) Avery

12. Mutants that exhibit a particular phenotype in some bacterial strains but not in others are called as

- a) point mutation
- b) double mutant
- c) jumping mutant
- d) suppressor sensitive mutant

13. A strain with F factor integrated with the bacterial chromosome is called as

- a) F'
- b) F+
- c) F-
- d) Hfr

14. Shine-Dalgarno sequence is

- a) 5'-CAGGAT-3'
- b) 5'-AGGAGG-3'
- c) 5'-TTGGCC-3'
- d) 5'-TTTGGG-3'

15. The synthesis of mRNA on a DNA template is made by

- a) RNA polymerase I
- b) RNA polymerase II
- c) RNA polymerase III
- d) RNA directed DNA polymerase

16. Which of the following is not a post transcriptional modification
- a) Splicing
  - b) 5' capping
  - c) 3' polyadenylation
  - d) glycosylation
17. The segment of a gene sequence to which the repressor protein binds
- a) Promoter
  - b) Structural
  - c) enhancer
  - d) operator
18. Dideoxy DNA sequencing exclusively depends on one of the following
- a) termination
  - b) ATP
  - c) plasmid vector
  - d) vector primer
19. End labeling of an oligonucleotide can be done by the help of
- a) DNA polymerase I
  - b) Klenow
  - c) T4 polynucleotide kinase
  - d) T4 DNA ligase
20. Which the following could be eliminated by hot start PCR
- a) aerosol contamination from the barrel of pipetters
  - b) addition of a nucleotide to the terminal end of PCR products
  - c) infidelity of DNA copying by Taq DNA polymerase
  - d) formation of primer dimers
21. Restriction modification systems of bacteria exist to
- a) protect bacteria from invading foreign DNA
  - b) promote conjugation
  - c) help the bacterial chromosome to replicate
  - d) encourage recombination of new genetic material
22. The method for putting recombinant DNA into a host cell that uses a suspension of DNA that has been exposed to high-voltage electrical impulses is
- a) Electroporation
  - b) Teleportation
  - c) Transfection
  - d) microinjection

23. Find the odd one out:

- a) Denaturation: 95°C
- b) Extension: 72°C
- c) Initial Denaturation: 94°C
- d) Annealing: 82°C

24. For Nick Translation the template has to be

- a) Single Stranded
- b) Double Stranded
- c) Oligonucleotide
- d) All of the above

25. Shotgun approach is used for the construction of

- a) cDNA library
- b) Genomic library
- c) Both
- d) None

26. To be a cloning vector a plasmid does not require

- a) Origin of replication
- b) An antibiotic resistance marker
- c) a restriction site
- d) have a high copy number

27. Mung bean nuclease could be used for

- a) DNA synthesis
- b) Nucleotide hydrolysis
- c) Trimming single stranded regions in DNA
- d) Removal of phosphate groups

28. For cloning a DNA fragment larger than 100kb which of the following vector system will be suitable?

- a) Plasmid
- b) Cosmid
- c) YAC
- d) Lambda bacteriophage

29. S1 nuclease is used for

- a) Sequencing
- b) Conjugation
- c) restriction of DNA
- d) map the transcription start point

30. A Reporter gene

- a) acts as repressor
- b) allows gene expression to be readily measured
- c) enhances mRNA stability
- d) interacts with RNAPolymerase

31. DNA foot printing is used to study

- a) DNA-Protein interaction
- b) Protein-Protein interaction
- c) DNA-RNA interaction
- d) RNA-RNA interaction

32. Reverse genetics means

- a) finding the function of a ORF
- b) finding the gene responsible for a trait
- c) RNA dependent DNA synthesis
- d) converting somatic cell to a germ cell

33. Which is not a step in Southern blotting procedure

- a) Ligation of DNA into a vector
- b) Separation of DNA fragment on a gel
- c) Transfer of DNA fragments to a nitrocellulose membrane
- d) Hybridization of membrane with a labeled probe

34. Expression vector contain a sequence, not normally found in other vector that is known as

- a) a ribosome binding site
- b) an Ori site
- c) a multiple cloning site
- d) an antibiotic resistant marker

35. Terminal transferase is used

- a) to add base at the 3' end of the DNA
- b) to add base at the 5' end of the DNA
- c) to carry out nick translation
- d) to transfer phosphate at the 3' end of the DNA

36. Who first developed the process of colony purification on solid media?

- a) Louis Pasteur
- b) Robert Koch
- c) Fannie Hesse
- d) Anton von Leeuwenhoek

37. The 70S procaryotic ribosomes consist of

- a) two 40S subunits
- b) a 50S and a 30S subunit.
- c) a 40S and a 30S subunit.
- d) a 50S and a 20S subunit.

38. Addition of salt to a culture medium only allows the salt-tolerant bacteria to grow. This is an example of a

- a) Enriched media
- b) Complex media
- c) Selective media
- d) Differential media

39. Starvation proteins are produced by a culture during which of the following parts of the growth curve?
- a) Lag phase
  - b) Exponential phase
  - c) Stationary phase
  - d) Death phase
40. Which of the following does not kill endospores?
- a) Autoclave
  - b) Incineration
  - c) Hot air sterilization
  - d) Pasteurization
41. Which of the following components is found in all procaryotic transcription terminators?
- a) rho factor
  - b) a poly-U region
  - c) a hairpin structure
  - d) a poly-A region
42. The transfer of a naked fragment of DNA between bacteria is called
- a) conjugation
  - b) transformation
  - c) transduction
  - d) replication
43. Which of these organisms has the smallest genome?
- a) Haemophilus influenzae
  - b) Mycoplasma genitalium
  - c) Mycobacterium tuberculosis
  - d) Streptococcus pneumoniae
44. The process by which phage reproduction is initiated in lysogenized culture is called
- a) Infection
  - b) Integration
  - c) Induction
  - d) Enhancement
45. Viroids are composed of
- a) single-stranded DNA
  - b) double-stranded DNA
  - c) single-stranded RNA
  - d) double-stranded RNA
46. To which kingdom do the cyanobacteria belong?
- a) Fungi
  - b) Plantae
  - c) Protista
  - d) Eubacteria
47. Which of the following genera fix nitrogen nonsymbiotically?
- a) Rhizobium
  - b) Nitrosomonas
  - c) Nitrobacter
  - d) Azotobacter

48. Fecal coliforms differ from coliforms by virtue of
- a) the ability of coliforms to ferment lactose within 48 hours and coliforms cannot.
  - b) fecal coliforms are Gram positive rods and coliforms are Gram negative rods.
  - c) having been derived from warm blooded animals and can grow at 44.5°C
  - d) fecal coliforms are facultatively anaerobic whereas coliforms are obligate anaerobes.
49. Which genus of bacterium contributes to plaque, caries, gingivitis, and periodontal disease?
- a) Streptococcus
  - b) Staphylococcus
  - c) Escherichia
  - d) Proteus
50. Which of the following refers to the addition of microorganisms to the diet in order to provide health benefits beyond basic nutritive value?
- a) Antibiotics
  - b) Prebiotics
  - c) Probiotics
  - d) Synbiotics
51. Transamination is a
- a) reversible process
  - b) Irreversible process
  - c) Both of the above
  - d) None of the above
52. Which of the following protein has quaternary structure
- a)  $\alpha$  Chymotrypsin
  - b) Hemoglobin
  - c) Insulin
  - d) Myoglobin
53. An example of trimeric protein is
- a) Lysozyme
  - b) Hemoglobin
  - c) Keratin
  - d) Collagen
54. In noncompetitive type of inhibition
- a)  $V_{max}$  decreases and  $K_m$  unchanged
  - b)  $V_{max}$  unchanged and  $K_m$  increases
  - c) Both  $V_{max}$  and  $K_m$  decreases
  - d)  $V_{max}$  decreases and  $k_m$  increases
55. The amino acid pair having highest absorbance at 280 nm
- a) Tyrosine and Tryptophan
  - b) Threonine and Histidine
  - c) Phenylalanine and Proline
  - d) Phenylalanine and Histidine

56. Rate of migration of protein in SDS-PAGE is not influenced by

- a) Size of the protein
- b) Charge of the protein
- c) Pore size of the gel
- d) Strength of the electric field

57. A solution of tryptophan has an absorbance at 280 nm of 0.54 in a 0.5 cm path length cuvette. Given the absorbance coefficient ( $\epsilon$ ) for tryptophan is  $5.4 \times 10^3 \text{ M}^{-1}\text{cm}^{-1}$ , the concentration of tryptophan in the solution will be

- a) 0.2mM
- b) 20mM
- c)  $1 \times 10^{-3}\text{M}$
- d) 0.1mM

58. The chromatographic technique used for separation of proteins based on specific biological interaction is

- a) Affinity chromatography
- b) Ion exchange chromatography
- c) Gel filtration chromatography
- d) Partition chromatography

59. Radioactive isotopes used to label proteins differentially from nucleic acids is

- a)  $^{32}\text{P}$
- b)  $^{14}\text{C}$
- c)  $^{35}\text{S}$
- d)  $^{15}\text{N}$

60. Henderson-Hasselbach equation is represented as

- a)  $\text{pKa} = \text{pH} + \log \frac{[\text{Proton acceptor}]}{[\text{Proton donor}]}$
- b)  $\text{pKa} = \text{pH} + \log \frac{[\text{Proton donor}]}{[\text{Proton acceptor}]}$
- c)  $\text{pH} = \text{pKa} + \log \frac{[\text{Proton donor}]}{[\text{Proton acceptor}]}$
- d)  $\text{pH} = \text{pKa} + \log \frac{[\text{Proton acceptor}]}{[\text{Proton donor}]}$

61. Agreptope is the region of antigen that is interacting with

- a) TCR
- b)MHC
- c) Both TCR and MHC
- d) Antibody

62. Mycobacterial cell wall is the immune system booster present in

- a) Alum
- b) Freund complete adjuvant
- c) Freund incomplete adjuvant
- d) Ribi adjuvant

63. Immunotechnique used for quantitative determination of number of cells in population
- a) ELISPOT
  - b) ELISA
  - c) RIA
  - d) Competitive ELISA
64. The signal transduction molecules associated with TCR are
- a) CD1.
  - b) CD3.
  - c) CD4.
  - d) CD8.
65. Antibody-dependent cell-mediated cytotoxicity (ADCC) is a process in which antibody-coated cells are killed by
- a) Antibodies.
  - b) Complement.
  - c) Cytotoxic T cells.
  - d) Cells with Fc receptors for IgG3.
66. IgM and IgG are
- a) Allotypes
  - b) Isotypes
  - c) Idiotypes
  - d) None
67. Maximum antigen and antibody interactions occur at
- a) Zone of equivalence
  - b) Zone of antigen excess
  - c) Zone of antibody excess
  - d) All of the above
68. The antibody with the lowest molecular weight is
- a) IgG
  - b) IgA
  - c) IgE
  - d) IgM
69. Multiple myeloma is the cancer of
- a) Memory B cells
  - b) Plasma cells
  - c) T cells
  - d) NK cells
70. Some antibodies like anti A, anti B in the serum act against bacterial agents, such cross interaction is due to
- a) Shared epitopes
  - b) Cross reactivity
  - c) Molecular mimicry
  - d) All of the above
71. Payer's patches are the secondary lymphoid tissue associated with
- a) Nose
  - b) Gut
  - c) Skin
  - d) Conjunctiva

72. The Chemokine secreted by the activated macrophage is

- a) IL-1
- b) IL-12
- c) IL-8
- d) IL-6

73. The most utilized diagnostic test for Typhoid fever is

- a) Weil – Felix test
- b) ELISA
- c) WIDAL test
- d) Western Blot

74. Coomb's Test is used to diagnose

- a) Grave's disease
- b) Anaphylaxis
- c) Hepatitis infection
- d) Erythroblastosis foetalis

75. RAST test is also known as

- a) Rapid Antigen Test
- b) Allergy test
- c) Rapid Antibody Test
- d) Rapid Agglutination test

76. Which one of the following is similarity searching program?

- a) CLUSTALW
- b) NCBI
- c) BLAST
- d) RASMOL

77. Local alignment refers to

- a) Smith and Waterman algorithm
- b) Needleman and Wunsch algorithm
- c) GOR algorithm
- d) Feng and Dolittle algorithm

78. Which one of the following is not a package?

- a) Emboss
- b) GCG
- c) Phylip
- d) CINEMA

79. Most common platform on which bioinformatics software are developed is

- a) SUN
- b) UNIX
- c) Windows
- d) Mac

80. The approach that can be used to predict the 3D structure of a protein which has no detectable sequence similarity with the available templates is

- a) homology modeling
- b) comparative modeling
- c) fold recognition
- d) ab initio modeling

81. Which protocol is used by browsers to communicate between two machines?

- a) ftp
- b) ssl
- c) tcp
- d) http

82. What is the difference between RefSeq and GenBank?

- a) RefSeq includes publicly available DNA sequences
- b) GenBank includes nonredundant curated data
- c) GenBank sequences are derived from RefSeq
- d) RefSeq sequences are derived from GenBank

83. Which one is used for sequence retrieval?

- a) Pubmed
- b) Genbank
- c) OMIM
- d) MMDB

84. PROSITE is a

- a) database of protein structures
- b) database of interacting proteins
- c) database of protein motifs
- d) search tool

85. The format of sequence accepted by most of the bioinformatics programs is

- a) PIR
- b) GCG
- c) FASTA
- d) ALN

86. DNA was extracted from a hemolyzed blood sample. The molecular diagnostician wants to know if the isolated DNA is contaminated with haemoglobin. Which instrument will be used to provide the information?

- a) Gas Chromatography
- b) UV Spectrophotometer
- c) Agarose gel electrophoresis apparatus
- d) Thermocycler

87. All of the following are advantages of molecular assays except

- a) Improved analytical and clinical sensitivity compares with the conventional methods
- b) More rapid turnaround time compared with culture.
- c) Inability to distinguish live from dead organisms
- d) Amenability to high throughput testing.

88. The type of testing performed routinely in crime labs around the world is

- a) RFLP
- b) Dot-blot
- c) STRs
- d) SNPs

89. Which one of the following genes is defective in patient suffering from SCID

- a) Cystic fibrosis transmembrane conductor (CFTR)
- b) adenosine deaminase
- c) ribonucleotide reductase
- d)  $\alpha$ 2-microglobulin

90. XXY genotype is associated with which syndrome?

- a) Klienfilter's Syndrome
- b) Down's Syndrome
- c) Turner's syndrome
- d) Pauta's syndrome

91. Which of the following is not an autoimmune disease

- a) Rheumatoid arthritis
- b) Lupus erythematosus
- c) Chaga's disease
- d) Grave's disease

92. Rheumatic heart disease caused due to molecular mimicry is caused by

- a) Streptococcal infection
- b) Staphylococcal infection
- c) Repeated Fever
- d) All the above

93. Pseudoautosomal gene is present on

- a) Both X and Y chromosomes
- b) Both X and autosomes
- c) Both Y and autosomes
- d) Only autosomes

94. The best molecular technique used to detect point mutations is

- a) SSCP
- b) AFLP
- c) Southern Hybridization
- d) Western Blotting

95. Which is the most modern tool used for classification of bacteria?

- a) Morphology
- b) Gram Staining
- c) Biochemical characterization
- d) 16S rRNA sequence

96. ABO blood grouping is a classic example for

- a) Agglutination reaction
- b) Precipitation Reaction
- c) Immunodiffusion
- d) All of the above

97. Target amplification techniques include:

- a) the PCR
- b) the ligase chain reaction
- c) strand displacement amplification
- d) all of the above

98. Which HIV-1 subtype is most common in India?

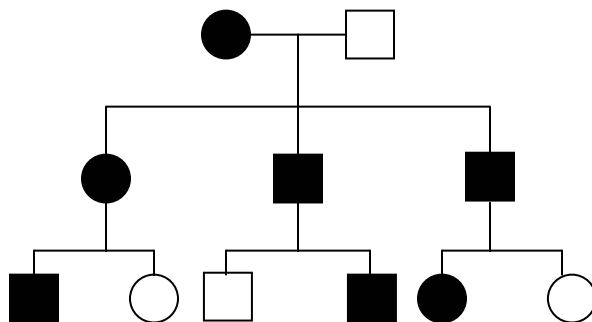
- a) A
- b) B
- c) C
- d) D

99. About what percentage of bases in the human genome code for proteins?

- a) 1%
- b) 10%
- c) 50%
- d) 95%

100. From the figure below, the inheritance pattern of the disease segregating in this family is most consistent with

- a) autosomal dominant
- b) autosomal recessive
- c) X-linked recessive
- d) mitochondrial inheritance.



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Key to Objective Type Questions

1 (d)	2 (b)	3 (a)	4 (c)
5 (a)	6 (d)	7 (a)	8 (c)
9 (b)	10 (c)	11 (b)	12 (d)
13 (d)	14 (b)	15 (b)	16 (d)
17 (d)	18 (a)	19 (c)	20 (c)
21 (a)	22 (a)	23 (d)	24 (b)
25 (b)	26 (d)	27 (c)	28 (c)
29 (d)	30 (b)	31 (a)	32 (b)
33 (a)	34 (a)	35 (a)	36 (b)
37 (b)	38 (c)	39 (c)	40 (d)
41 (c)	42 (b)	43 (b)	44 (c)
45 (c)	46 (d)	47 (d)	48 (c)
49 (a)	50 (c)	51 (a)	52 (b)
53 (d)	54 (a)	55 (a)	56 (b)
57 (a)	58 (a)	59 (c)	60 (d)
61 (b)	62 (b)	63 (a)	64 (b)
65 (c)	66 (b)	67 (a)	68 (a)
69 (b)	70 (d)	71 (b)	72 (c)
73 (c)	74 (d)	75 (b)	76 (c)
77 (a)	78 (d)	79 (b)	80 (d)
81 (d)	82 (d)	83 (b)	84 (c)
85 (c)	86 (b)	87 (c)	88 (c)
89 (b)	90 (a)	91 (c)	92 (a)
93 (a)	94 (a)	95 (d)	96 (a)
97 (d)	98 (c)	99 (a)	100 (a)

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**OUTLINE OF SYLLABUS**

**Objective Type Questions (100) have to be framed from the following areas of Life Sciences at Post Graduate level.**

- 1. Molecular Biology**
- 2. Microbiology**
- 3. Biochemistry**
- 4. Immunology**
- 5. Recombinant DNA Technology**
- 6. Bioinformatics**
- 7. Molecular Diagnostics**