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QUESTION BANK

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C.P.12GENOMICS, PROTEOMICS AND BIOINFORMATICS (15UBT612)

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SECTION A

1. STS markers are assayed by -----against a library of large insert clones.
(a) **PCR** (b) SNP (c) fingerprinting (d) SAGE.
2. On the genetic map, distances between markers are measured in terms of.
(a) Hertz (b) **centimorgans** (c) decibel (d) both a & b
3. Genetic mapping resolution has been increased through the application of -----.
(a) RNA technology (b) Microarray (c) **recombinant DNA technology** (d) PAGE
4. -----was the first marker to be used
(a) **Genes** (b) RFLP (c) SSLP (d) snp
5. -----were the first type of DNA marker to be studied.
(a) **RFLP** (b) SSLP (c) SNP (d) STS
6. Different types of physical maps vary in their -----.
(a) **degree of resolution** (b) Density (c) distance (d) Length
7. The FISH is Mapping technique to study the
(a) **Gene location on a genome** (b) Protein location
(c) Amino acid location (d) Genome counting
8. The Chain termination method is related to
(a) **DNA sequencing** (b) Protein Quantification
(c) DNA Quantification (d) Colorimetric assay
9. The genome of an organism is its whole -----hereditary information.
(a) **Hereditary** (b) Structure (c) Complementary (d) Activity
10. The term genome was adapted in -----
(a) Johanson 1909 (b) Valter 1920 (c) **Hans Winkler 1920** (d) Hooke 1922
11. -----is the first organism to be sequenced
(a) *S.Cerevisiae* (b) *E.coli* (c) ***H.Influenzae*** (d) *Mycoplasma Genitalium*
12. SNP is a type of
(a) **Mutation** (b) Restriction (c) Mapping (d) Ligation
13. Simple Sequence Length Polymorphism technique related to
(a) VNTR (b) Mini satellite (c) Microsatellite (d) **Both b and c**

14. Some restriction enzymes cut the DNA very infrequently are called-----
 (a).**rare- cutters** (b).absolute cutters (c) SNP (d).RFLP
15. -----Uses restriction map data to determine which fragments have a specific sequence in common and therefore overlap.
 (a).FISH (b)SNP (c) **fingerprinting** (d)SAGE
16. ----- Techniques can be used to fill in the gaps.
 (a).FISH (b)SNP (c) fingerprinting (d) **DNA probe.**
17. The lowest- resolution physical map is the -----map.
 (a) Integrated (b) Transcript (c) **Chromosomal** (d) Linkage
18. FISH was developed by-----
 (a)Watson (b) John teller (c) **Heiskanen** (d) Peter
19. Individual unassembled sequence reads, produced by sequencing of clones containing DNA inserts are called----- sequence.
 (a)**Raw** (b) Nucleotide (c) Transcribed (d) Translate
20. ----- have long pedigrees but which were rarely applied in the pre-genomics era
 (a) **Protein Electrophoresis** (b)Gel Electrophoresis (c)Blotting
 (d)Sequencing

UNIT II

21. A-----is an array of small glass slide containing Probes.
 (a)Alignment (b) **Microarray** (c) SNP (d) MSA
22. DNA Microarrays works on the principal of -----.
 (a) **Base Pairing** (b) Mutation (c) Replication (d) Alignment
23. The composition of a transcriptome can be assayed by -----.
 (a)Gel Electrophoresis (b) **SAGE** (c) SNP (d) RFLP
- 24.The relative abundance of each strain in the pool is measured on an -----array.
 (a) **Oligonucleotide** (b) Motif (c) RNA (d) Microarray
25. -----is the process by which inheritable information from a gene is made into a functional gene product.
 (a) Polymorphism (b) **Gene Expression** (c) Replication (d) Gene Regulation

26. Examination of the transcriptome Writes an accurate indication of which genes are active in a particular cell.
(a)Active (b) Inactive (c) Discrete (d) Continuous
27. The expression of many genes is regulated after -----.
(a)Transcription (b) Translation (c) Replication (d) Duplication
28. Proteins are activated by
(a)Phosphorylation (b) Acetylation (c) Sumoylation (d) Glycosylation
29. Long chain of amino acids are called
(a)Protein (b) Amino acids **(c) Polypeptide** (d) Poly Amino acids
30. Mass spectrometry is used to study
(a)DNA sequence **(b) Compound molecular weight**
(c)Protein sequence (d) None of these
31. -----is the process by which inheritable information from a gene is made into a functional gene product.
(a) Polymorphism **(b) Gene expression** (c) Replication (d) Gene Regulation
32. At first the transcription process is related to
(a) Gene transfer (b) c-DNA **(c) Pre m-RNA Synthesis** (d) Mature m-RNA
33. In DNA Microarray uses fluorescent dyes namely
(a) Propidium iodide **(b) Cyn 3 + Cyn 5** (c) Sybr green (d) Ethidium bromide
34. In the Microarray, a fluorescent emission of a gene analyzed by
(a) Spot analysis **(b) Spot and image analysis** (c) Dot blots (d) Northern blot
35. DNA is associated with DNA-binding proteins called -----.
(a)Histones (b) Nucleosome (c) Chromatid (d) Plastids
36. -----are transcripts of protein-coding genes and hence are translated into protein.
(a)mRNAs (b) tRNAs (c) rRNA (d) HnRNAs
37. The -----structure refers to the different conformations that can be taken up by the polypeptide.
(a)Primary **(b) Secondary** (c) Tertiary (d) Quaternary
38. X ray diffraction analysis is to find the
(a)Protein Structure (b) Structure comparison
(c) DNA Structure **(d) Both A and C**

39. NMR analysis is to find the

- (a) Protein Structure (b) Structure comparison
(c) DNA Structure (d) **Both A and C**

40. MALDI and SELDI are the techniques to

- (a) To sequencing of DNA (b) **to characterize the protein**
(c) To quantification of protein (d) to sequencing of amino acids

UNIT III

41. Who among the following invented the small pox vaccine?

- (a) **Edward Jenner** (b) Leuwis Pasteur (c) Karymullins (d) Sanger

42. The drug which is not used in the treatment of tuberculosis

- a) Rifampin b) Isoniazid c) DARQ (d) **Amantadine**

43. A good example of drug protein interaction

- (a) **Nutlin-mdm2 binding** (b) Nutlin-p21 (c) Doxorubin mdm4 (d) Mdm4 ampicillin

44. Two drugs responsible for inhibition of mdm-2 binding

- (a) **Nutlin-AMG232** (b) Nutlin- doxorubicin (c) Doxorubin alone (d) Nutlin- amoxlyin

45. Monoclonal antibodies made by

- (a) **Single modification** (b) multiple modification (c) Combination (d) Protein interaction

46. Drug designing was done in previous centuries by

- (a) Animal studies (b) Human studies (c) *In-Vitro* studies (d) *In-silico* studies

Drug discovery is relation to

- (a) **Inventing new therapeutic molecular** (b) Antibody (c) Vaccine (d) Invention

47. The ----- is the multiple alignments of several protein sequences.

- (a) Motif (b) **Profile** (c) Domain (d) Clusters

48. ----- have long pedigrees but which were rarely applied in the pre-genomics er(a)

- (a) **Protein electrophoresis** (b) Gel electrophoresis (c) Blotting (d) Sequencing

The yeast is commonly called as the -----.

- (a) **Baker's yeast** (b) Spore yeast (c) Buds (d) Dead cells.

49. Yeast has been introduced as an experimental organism in -----.

- (a) 1982 (b) **1981** (c) 1880 (d) 2000

50. Yeast is ----- fungi.

- (a) Multicellular (b) **Unicellular** (c) Parasite (d) Cellular

51. The bait and prey are the two protein molecules employed in the
(a) Yeast two hybrid system (b) ELISA method
(c) Structure validation (d) Sequencing
52. First dimension electrophoresis of protein is called
(a) Differential electrophoresis (b) Gel electrophoresis
(c) Iso-electric focusing (d) none of them
53. Immunomics is study of
(a)Antibody (b) Antibody interaction **(c) Antibody Antigen Titer** (d) Drug Discovery
54. Vaccinomics is study of
(a)Antigen types (b) Epitope (c) Subunit **(d) Antigen antibody interaction**
55. Pharmacogenomics is related to
(a)Pharma proteins (b) Immune proteins **(c) Therapeutic proteins** (d) Antibody
56. Drug discovery is related with the designing of
(a)Drugs **(b) Therapeutic drugs** (c) Monoclonal antibody (d) Chemical drugs
57. In Genomics, the term “**Drug - target**” is related to
(a) To find drug binding site (b) To find drug function
(c) To predict drug activation (d) sequencing of amino acids
58. As early as in 1980, ----- was used to produce Hepatitis B vaccine.
(a)Humans **(b) S. Cerevisiae** (c) Mus (d) Fruit fly
59. In DNA Microarray gene were hybridized with
(a) tRNA (b) mRNA (c) cDNA (d) Genomic DNA
60. SAGE will be used for prediction of
(a) Gene expression (b) Protein expression (c) Protein interaction (d) Chemical structure

UNIT IV

61. Developmental biology of gene expression is related to
(a) Gene expression at various stages of embryo development
(b) Types of production of cells
(c) Human embryo development
(d) Protein production
62. Regulatory genes are
(a)Regulating cells (b) Killing cells **(c) Controlling cell cycle** (d) Controlling cell signal

63. Stanford microarray data base is storing data of
(a) Gene expression (b) Lipid production (c) Protein expression (d) Antibody production
64. Microarrays are used for the studying of
 (a) 10 genes b, 100 genes (c) 500 genes **(d) 1000 genes**
65. In Microarray, tagging is term using for
(a) Group of genes (b) group of exons (c) group of intron (d) group of pseudo genes
66. OMIM database was initiated in the early 1960s by -----.
(a) Dr. Victor A (b) Dr. James (c) Dr. Wilson (d) Dr. Walter.
67. In Genomics and proteomics, the data normalization will be done
(a) To avoid the error and noise (b) To remove normal data
 (c) To remove sample data (d) to adjustment of data
68. -----is the NIH genetic sequence database, a collection of all publicly available DNA sequences.
 (a) NCBI **(b) GenBank** (c) EXPASY (d) Both of a & b
69. The----- database is intended to provide information on the sequences.
 (a) NCBI (b) GenBank (c) EXPASY **(d) ncRNA**
70. ----- is an integrated knowledge database dedicated to non-coding RNAs
(a) NONCODE (b) Profile (c) Domain (d) Clusters
71. EST or full length mRNA from the public databases is -----.
(a) cDNA (b) DNA (c) RNA (d) Clones
72. ----- is a non-redundant vector database available from NCBI.
 (a) Vector **(b) UniVec** (c) DNA (d) mRNA
73. Pathway databases retrieving data from
(a) PDB database (b) Nucleotide database (c) Swissprot (d) None of these
74. Kinetic database describes the interaction between
 (a) Drug and protein (b) Drug drug interaction
 (c) Protein-protein interaction **(d) Drug protein energy release**
75. Model database used for the studying of
(a) Simulation (b) Amino acids (c) Secondary structure (d) Mutation
76. KEGG data base is maintained from
(a) Japan (b) Europe (c) USA (d) Russia

77. Which of the following is untrue?
(a) Eukaryotic nuclear genomes are much larger than prokaryotic ones
(b) They tend to have a very high gene density
(c) Eukaryotic nuclear genomes' sizes range from 10 Mbp to 670 Gbp (1 Gbp = 10⁹ bp)
(d) They tend to have a very high gene density

78. Most vertebrate genes use ____ as the translation start codon and have a uniquely conserved flanking sequence call a Kozak sequence (CCGCCATGG).
(a) AAG (b) **ATG** (c) AUG (d) AGG

70. Which of the following is untrue about Ab Initio–Based Programs for Gene Prediction?
(a) The goal of the ab initio gene prediction programs is to discriminate exons from noncoding sequences
(b) The goal is joining exons together in the correct order
(c) The main difficulty is correct identification of exons
(d) To predict exons, the algorithms rely solely on gene signals

80. Cluster of genes is
(a) **Group of genes** (b) Group of Pseudo genes
(c) Group of introns (d) Group of exons

UNIT V

81. NGS data will be written in the form of
(a) PDB (b) Chromatography (c) Fasta format (d) **Chromatogram**

82. NGS uses different fluorescent dyes for
(a) Proteins (b) **Each nucleotides** (c) Group of nucleotides (d) Primers

83. DNA array are used for
(a)Study gene expression (b) Protein expression (c) Tagging of gene(d)Genome function

84. cDNA array are the part of
(a) 2D PAGE (b) **DNA microarray** (c) Protein quantification (d) Gene quantification

85. Analysis of gene expression data is to
(a) **Access the gene expression** (b) Clustering of genes
(c)Protein profiling (d) Gene profiling

86. High through put experiments are
(a)Easy to handle (b) **Tough to handle** (c) Cannot be handled (d) None of these

87. In high throughput experiments cost will be
(a)Low (b) Medium (c) **High** (d) None of these

88. In the Pyro sequencing the following enzyme will be used
 (a) DNA polymerase (b) **luciferase** (c) Hexokinase (d) Insulin
89. In 454 sequencing the limitation of nucleotide per read is
 (a) 300 (b) 600 (c) 700 (d) **454**
90. Clustering algorithm is used in gene expression studies for
 (a) **Grouping** (b) Quantifying (c) Qualifying (d) Counting
91. Hierarchical clustering is a term used to analyses of gene
 (a) Outside to gene cluster (b) **Inside the gene cluster**
 (c) Analysis of genes each other (d) Analysis of all genes
92. Grouping of genes are called
 (a) **Clustering** (b) Griding (c) Gathering (d) None of these.
93. ROC curve analysis is to
 (a) Quantification of gene (b) Quantify the data
 (c) **Qualify the expression** (d) None of these
94. The clustering of genes is employing the
 (a) **Centralization of gene** (b) Higher expression (c) Normalization (d) Removing of genes.
95. Gene expression data will be stored for clinical database for
 (a) Hereditary information (b) Drug discovery (c) protein expression (d) **All these**
96. A sequencing gel is a _____ gel.
 a) Toxic b) Highly-polymerized c) High resolution (d) **Low resolution**
97. Which of the following is untrue about DNA sequencing?
 (a) It is now routinely carried out using the Sanger method
 (b) **This doesn't make use of DNA polymerases**
 (c) This involves synthesis of DNA chains of varying length
 (d) The DNA synthesis is stopped by adding dideoxynucleotides
98. The hierarchical genome sequencing approach is _____
 (a) Entirely dissimilar to the shotgun approach
 (b) Dissimilar to the shotgun approach
 (c) Similar to the shotgun approach, but on a larger scale
 (d) **Similar to the shotgun approach, but on a smaller scale**
99. The hierarchical approach is _____ and then the shotgun approach because it involves an initial clone-based physical mapping step.
 (a) **Slower, less costly** (b) Faster, costly (c) Faster, less costly (d) Slower, more costly

100. Spot quantification will be used for
(a) **Data evaluation** (b) Data normalization (c) Protein expression (d) Clustering

SECTION B

UNIT I

1. Compare genetic and physical mapping.
2. Describe what is sequencing.
3. Define gene? Write short notes on Genome?
4. Describe about genome map?
5. Describe the Polymorphic markers?
6. State SNP and write a note on SNP diagnosis?
7. Describe about Simple sequence length polymorphisms
8. Demonstrate the genetic markers with suitable examples
9. Write a note on genetic mapping?
10. Write a note on Cytogenetic map?

UNIT II

11. What is proteomics?
12. Demonstrate the structural proteomics.
13. Describe about protein crystallization.
14. Write a note on SELDI with suitable examples
15. What are Protein isolation and purification techniques
16. Describe the genomes of eukaryotes?
17. Define the various steps involved in SAGE?
18. Describe EST in detail.
19. How to state Gene expression?
20. Microarray applications and uses in gene expression studies

UNIT III

21. How to you describe protein –protein interaction
22. Write a note on isoelectric focusing.
23. Write short note on protein interaction and modification
24. Write detailed note on AGE and PAGE electrophoresis for biomolecules
25. Yeast two hybrid system.
26. Write short notes on model organisms for drug target?
27. Describe the pharmacogenomics.
28. How do you identify targets?
29. Write an detailed account on protein drug interaction
30. Demonstrate the protein based drug designing.

UNIT IV

31. Write short note on micro array tagging.
32. What are the types of biological tools and data formats?
33. Describe the following: SBML.and BioPAX.
34. Exhibit the function of Structural databases.
35. What is bio model? Describe the uses.
36. What are the applications of functional genomics?
37. Describe about developmental biology.
38. What are embryonic stem cells and functions?
39. How do you find the stem cells types?
40. Write short account on gene expression on embryo development.

UNIT V

41. Write short note on cDNA array.
42. Exhibit the ROC curve in gene clustering
43. What are the two methods for clustering of genes?
44. Describe the grid finding and linear models
45. Debate self-organizing map.
46. State Genome & describe the Genome sequencing?
47. Write a detailed explanation on Next generation sequencing
48. What is data analysis and normalization?
49. Describe about spot quantification.
50. Describe about the NGS data analysis

SECTION C

UNIT I

51. Describe Radiation hybrid mapping and STS mapping in detail.
52. Exhibit the gene sequencing methods from previous year to till date.
53. Describe shot gun and clone by clone methods in detail.
54. What are the functions of automated DNA sequencing?
55. Describe biotechnology in human genome project.
56. Describe about genetic markers in detail with suitable examples.
57. Write detailed account on SNP and SSLP markers
58. Exhibit the uses of genetic markers in diseases and identity.
59. How to perform AFLP in experimentally.
60. How to access gene location on genome? Describe with suitable example.

UNIT II

61. Exhibit the protein extrication method and quantification.
62. What is structural proteomics? Describe the structure prediction methods.
63. Describe about X-ray crystallography and NMR in detail.
64. Demonstrate the functions of Mass spectrometry.
65. Write a detailed account to the MALDI and used in medicine field.
66. Describe about gene expression in detail with suitable examples.
67. Write a detailed account on serial analysis of gene expression with suitable examples.
68. What is DNA Microarray? Describe gene expression patterns.
69. How to you find the normal and abnormal condition of a cell using DNA microarray?
70. Write a detailed note on microarray techniques in clinical diagnosis.

UNIT III

71. Demonstrate the function and used of bait and prey protein in yeast two hybrid system.
72. Validation of protein expression and protein profiling
73. Describe about isoelectric focusing and 2D PAGE in detail.
74. Write a detailed note on protein purification techniques and types.
75. Define about proteomic in clinical diagnosis in detail.
76. Describe about Immunomics and vaccinomics in detail.
77. Write detailed account on vaccine development and production.
78. How to find target for your drug? Describe in detail.
79. What is drug targeting and Write detailed note on protein drug interaction
80. Exhibit the protein - protein interaction in detail.

UNIT IV

81. Write the tools and techniques used in proteomics.
82. Write detailed account on the methods of gene family identification.
83. Debate Pathway, Kinetic and Structural database in detail.
84. Describe the Classification of databases and used in human genome project.
85. Write detailed notes on bio models and simulation of proteins.
86. Define about embryonic development in detail.
87. What is differential gene expression of developmental biology?
88. Write detailed account on stem cell and its types.
89. Describe about gene profiling during embryonic development and cellular differentiation?
90. How to do you predict and analyses the Stanford microarray data?

UNIT V

91. Evaluate the gene expression data and documentation.
92. What is DNA array? How it will be helpful in clinical studies.
93. Write a detailed explanation on clustering algorithms.
94. Debate gene expression data analysis, grid finding and evaluation.
95. Describe self-organizing map in human genome.
96. Define about high throughput experiment in detail.
97. Describe a detailed methodology on Next generation sequencing.
98. Exhibit sequencing and data analysis with suitable examples
99. Write about NGS data evaluation in detail
100. Describe Pyro sequencing and 454 sequencing in detail.

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MAJOR ELECTIVE MEDICAL BIOTECHNOLOGY (16UBT6E2)

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SECTION A
UNIT I

1. The Food, Drug and Cosmetic Act allowed FDA to inspect facilities, and brought insulin under FDA jurisdiction. When was it enacted?
(a) 1922 (b) 1924 (c) **1938** (d) 1926
2. When were the first products extracted from cell culture approved?
(a) **1943** (b) 1925 (c) 1976 (d) 1998
3. When was the first recombinant product approved?
(a) 1978 (b) 1974 (c) 1945 (d) **1982**
4. What was the first recombinant product introduced
(a) **Humulin** (b) Amylase (c) Penicillin (d) Insulin
5. Prior to 1962, drugs were regulated based mainly upon their safety. The Kefauver-Harris Amendment in 1962 called attention to the concept of what?
(a) Not efficient (b) **Efficacy** (c) Somewhat (d) None of these
6. The Biologics License Application (BLA) was introduced when?
(a) 1978 (b) 1974 (c) 1945 (d) **1996**
7. This 1997 Act sought to minimize the differences between how biologics and other drugs were regulated, what was its name?
(a) **FDA modernization act** (b) INDIAN FDA modernization act
(c) EU FDA modernization act (d) FDA act
8. What is the name of the 21st century initiative aimed at accelerating drugs' time to market?
(a) Normal initiation (b) **Critical path initiative**
(c) Starting up (d) None of these
9. FDA drug must pass in the following rule
(a) Kinski's rule (b) **Lipinski's rule**
(c) Chargaff rule (d) None of these
10. Drug discovery is a process of
(a) Inventing new drug (b) Inventing new protein
(c) Combination of two drug (d) **Both a and b**
11. The first person to discover micro organisms
(a) **Leeuwenhoek** (b) Kock (c) Hook (d) None

12. Prescription drug advertising and promotional labeling is governed by which of the FDA Center for Drug Evaluation and Research (CDER) offices listed below?

- (a) Office of New Drugs
- (b) Office of Prescription Drug Promotion (OPDP)
- (c) Office of Drug Security, Integrity and Recalls
- (d) Office of Unapproved Drugs and Labeling Compliance (OUDLC)**

13. Which of the following is not a Supplier Audit criterion:

- (a) Process Control**
- (b) Product Identification and Traceability
- (c) Internal Audits
- (d) Rating Analysis Recap

14. Which of the following is not a General Requirement in a cleaning validation program:

- (a) Written procedures on how cleaning processes will be validated
- (b) Written validation protocols in advance
- (c) FDA approval of new drug application (NDA)**
- (d) Validation report stating whether or not cleaning process is valid

15. When was insulin first approved for the treatment of diabetes?

- (a) 1922**
- (b) 1926
- (c) 1924
- (d) 1920

16. Rational drug discovery is to develop drug according to the

- (a) Continent**
- (b) Country
- (c) State
- (d) District

17. Combinatorial drug design is process of developing of

- (a) New drug combination**
- (b) New nucleotide combination
- (c) New drug and protein combination
- (d) none of these

18. The therapeutic index of a drug is a measure of its

- (a) Safety
- (b) Efficacy
- (c) Potency
- (d) Dose variability**

19. Which of the following terms is used to Define a drug that has the same effect on a receptor as the endogenous chemical messenger?

- (a) Agonist**
- (b) Antagonist
- (c) Partial agonist
- (d) Inverse agonist

20. *In-silico* drug design will be used for

- (a) Genome therapy**
- (b) RNA therapy
- (c) Protein production
- (d) none of these

UNIT II

21. Doppler velocimetry works on the principle of
(a) **Frequency measure of fiber optic sensor** (b) amplitude measurement of fiber optic sensor
(c) Phase measurement of fiber optic sensor (d) time shift measurement of fiber optic sensor
22. Fluoroptic temperature sensors work on the principle of _____
(a) Thermistor (b) Thermocouple (c) **Optical fiber** (d) Rtd
23. Monopolar needle electrode are have a coating of which material over the stainless steel wires which are bare only at the tips?
(a) Carbon (b) Calcium (c) Sodium (d) **Teflon**
24. Endoscopic imaging uses
(a) Thermal sensors (b) Chemical sensors (c) **Optic fiber sensors** (d) Pressure sensors
25. The biological response of the biosensor is determined by
(a) **Bio catalytic membrane** (b) physic-chemical membrane
(c) Chemical membrane (d) artificial membrane
26. Home blood glucose sensor works on which principle
(a) Electro-physiological (b) **Electrochemical** (c) Physic-chemical (d) Chemical
27. The chemical reaction of glucose with oxygen is catalyzed in the presence of
(a) **Glucose oxidase** (b) monoglucose carbodase
(c) Glucose dioxidase (d) biglucose oxidase
28. How many optical isomers are possible in a compound with one chiral carbon
(a) 5 (b) 4 (c) 2 (d) **3**
29. Which of the following compound would show optical isomerism?
(a) **CH₃ – CH (OH) COOH** (b) H₂N CH (CH₃)₂
(c) (CH₃)₂ CHCHO (d) H₂N CH₂ COOH
- The process of introduction of weakened pathogen into human body is called
a) Immunization (b) **Vaccination** c) Attenuation d) None of these
30. The first vaccine was developed by
(a) **Louis Pasteur** (b) Edward Jenner (c) Carl Landsteiner (d) Joseph Miester
31. The concept of vaccination was first developed by
(a) Louis Pasteur (b) **Edward Jenner** (c) Carl Landsteiner (d) Joseph Miester

32. The process of weakening a pathogen is called
 (a) Vaccination **(b) attenuation** (c) immunization (d) virulence reduction
33. The first vaccine developed by Louis Pasteur was against
 (a) Pox virus (b) Hepatitis virus (c) **Rabies virus** (d) none of these
34. A vaccine can be
 (a) An antigenic protein (b) weakened pathogen (c) live attenuated pathogen **(d) all of these**
35. The sufficient condition for showing optical activity is
 (a) Molecule should have measurable amount of optical activity only
 (b) Polarimeter should have capacity of recording low-degree optical activity only
 (c) Chirality of molecule as a whole only
(d) Both, the molecule should have measurable amount of optical activity and Polarimeter should have capacity of recording low-degree optical activity
36. The approach (s), which is/are currently followed to produce human monoclonal antibodies, is/are known as
 (a) transformation of antigen specific B lymphocytes (EBV)
 (b) Hybridization of 6-thioguanine-resistant human plasmacytoma with immune human lymphocytes
 (c) Combination of EB V and hybridoma techniques
(d) all of these
37. Some cross reactions with monoclonal antibodies (MAbs) can occur. Unexpected cross reactions occur more frequently with
 (a) **IgG mAbs** (b) IgG (c) IgA (d) IgE
38. Preliminary clinical results with a humanized antibody against the interleukin-2 receptor have suggested the
 (a) Absence of human immune response against murine proteins (HAMA) response
 (b) Presence of HAMA response
 (c) Poor recognition of immunoglobulin, Ig constant regions
(d) all of the above.
39. In monoclonal antibody technology, tumor cells that can replicate endlessly are fused with mammalian cells that produce an antibody. The result of this cell fusion is a
 (a) **Hybridoma** (b) Myeloma (c) Natural killer cell (d) Lymphoblast
40. Attenuated vaccine are the type of
 (a) Inactivated (b) destroyed (c) neutralized (d) combined

UNIT III

41. Which of the following disinfectant is effective against viruses?
(a) Hydrogen peroxide (b) Hypochlorite (c) Formaldehyde (d) **All of these**
42. Viruses largely lack metabolic machinery of their own to generate energy or to synthesize
(a) **protein** (b) carbohydrate (c) alcohol (d) all of these
43. Viruses require _____ for growth.
(a) Bacteria (b) Plants (c) Animals (d) **living cells**
44. Reverse transcriptase is a useful enzyme to have when
(a) **An RNA virus converts its RNA to DNA** (b) there are no host cells present
(c) Nutrients are scarce (d) spikes are forming in the new virus
45. The sequence of nucleic acid in a variety of viruses and viral host, will find more similarities
(a) Among different viruses than between viruses and their hosts
(b) Among different viral hosts than among different viruses
(c) Among different viral hosts than between viruses and their hosts
(d) **Between viruses and their hosts than among different viruses**
46. Which of the following immune cells would have an especially low count in a patient with advanced AIDS?
(a) Killer T lymphocytes (b) **Helper T lymphocyte** (c) B lymphocytes (d) None of these
47. What is the most common cause of **aseptic meningitis** of viral etiology?
(a) **Enteroviruses** (b) Herpes viruses (c) Arboviruses (d) Retroviruses
48. Which one of the following immunizations should be administered **immediately after birth**?
(a) Diphtheria-pertussis-tetanus (DPT) vaccine
(b) Haemophilus influenza type b vaccine
(c) **Hepatitis B vaccine**
(d) HIV Vaccine
49. The finding of large, multinucleated, clumps of cells in the bronchial secretions of a 2 year old girl with acute bronchopneumonia suggests that this infection is caused by
(a) Bordetella pertussis (b) Epstein-Barr virus
(c) Mycoplasma hominis (d) **Respiratory syncytial virus (RSV)**
50. All of the following picornaviruses are resistant to the acidity of the stomach except
(a) Coxsackievirus A (b) Coxsackievirus B (c) Poliovirus (d) **Rhinovirus**

51. Which of the following is a polysaccharide vaccine
 (a) Anthrax vaccine (b) rabies vaccine (c) hepatitis A (d) **Hib vaccine**
52. Human insulin formed by recombinant DNA technology is known as
 (a) Human insulin (b) Recombinant insulin (c) **humilin** (d) None of these
53. The gene coding for VP1 is cloned in
 (A)pMB 9 (b)**pBR 322** (c)pUC 18 (d)pUC 19
54. How many nucleotides are there in SS RNA molecule of picorna virus causing FMD?
 (A) 1000 (b) 5000 (c) **8000** (d) 10000
55. Recombinant vaccine for Hepatitis B virus has been synthesized against which of the following antigen?
 (A)Viral core antigen (HBcAg) (b) **Viral surface antigen (HBsAg)**
 (c) Antigen (HBeAg) (d) All of the above
56. Chemically synthesized DNA sequences for the two chains are separately inserted into the plasmid pBR 322 by the side of
 (a) **β -Galactosidase** (b)galactokinase (c)acid phosphatase (d)glucokinase
57. Which of the following is correct for CD8 T cells?
 (a)CD8 T cells only recognize virus-infected cells
 (b)CD8 T cell receptor recognizes epitopes that are also commonly recognized by B cells
 (c)In the thymus, CD8 T cells undergo positive selection only, whereas CD4 T cells undergo negative selection only
 (d)**CD8 T cells can kill individual virus-infected cells in a contact dependent fashion**
58. Choose the incorrect statement out of the following for human immune deficiency virus
 (a) The reverse transcriptase enzyme is characteristic feature of retroviruses
 (b) P10 is a protease that cleaves gag precursor
 (c) P32 is an integrase
 (d) **Gag encodes for the lipid bilayer of the virus**
59. The specific binding of HIV to the CD4 surface molecules of the host cell membrane is brought about by
 (a)**gp 120** (b)gp 41 (c)p32 (d)p55
60. All of the following except one are CD4+ cells
 (a) Monocytes (b) T-helper cells (c) **T-cytotoxic cells** (d) Macrophages

UNIT IV

61. The number of different amino acids that combine to form human protein is generally recognized as:

- (a) 10 **(b) 20** (c) 35 (d) 60

62. Amino acids show unusual chemical behaviour especially because they:

- (a) Contain the elements carbon, hydrogen, oxygen and nitrogen
(b) Contain the amide functional group
(c) Are chiral
(d) Contain both an acidic and a basic functional group on the same molecule

63. High quality protein is protein that:

- (a) Contains all the amino acids found in human protein
(b) Contains all known amino acids
(c) Contains all the essential amino acids in the same sequence as they are found in human protein
(d) Contains all the essential amino acids in about the same ratio as they occur in human protein

64. The peptide link of proteins is identical with the chemical group known as the:

- (a) Aldehydes **(b) amide** (c) carboxylic acid (d) ester

65. Tissue engineering is developed into invitro.

- (a) *In-vitro*** (b) *In- vivo* (c) *In-silico* (d) none of these

66. Hyaline is characterized by its:

- (a) White appearance **(b) Glassy appearance** (c) Red appearance (d) Crystal appearance

67. What do you mean by Extracorporeal?

- (a) Outer layer of the tissue **(b) Outside of the body**
(c) Inner layer of the tissue (d) Inside of the body

68. The neurotransmitters are classified into

- (a) Two broad categories** (b) Three broad categories (c) Six broad categories (d) Eight broad categories

69. Pressure ulcers affects mainly the

- (a) Nephron (b) Lungs **(c) Skin** (d) Kidney

70. Chondrocyte is the cell which secretes

- (a) Liver cells (b) Bone cells **(c) Cartilage cells** (d) Heart cells

71. The organs cannot be conserved in
 (a) Cryopreservation (b) Deep freezing (c) Glycerol (d) **All of these**
72. A micro array is an ordered array of microscopic elements on a planer substrate that allows the specific binding of
 (a) **Gene or gene products** (b) whole genome (c) both (a) and (b) (d) none of these
73. If the remedial gene does the function of defective gene the approach is called as
 (a) Gene replacement therapy (b) gene augmentation therapy
 (c) **Both a and b** (d) Corrective gene therapy
74. Commonly using nano substance for diagnose and treating cancer
 (a) **Silver** (b) Gold (c) Zinc (d) Graphene
75. Nano particles will be mainly used only for
 (a) **Delivery** (b) Doping (c) combination (d) All of these
76. A protein is poorly expressed in a diseased tissue. To determine whether the defect is at the level of transcription or translation, which of the following blotting techniques would you use?
 (a) Southern and Western (b) Southern and northern
 (c) Northern and Western (d) **Western and South –western**
77. The polymerase chain reaction (PCR)
 (a) is used to transcribe specific genes (b) **amplifies specific DNA sequences**
 (c) Uses a DNA polymerase that denatures at 55 0 C (d) is a method for sequencing DNA
78. Genome wise gene expression analysis is performed using
 (a) **DNA microarrays** (b) Northern analysis (c) Real time PCR (d) RT-PCR
79. Triton X-100 is a surfactant that forms micellar structure in aqueous solutions. One can form reverse micelles of the surfactants easily by
 (a) Addition of salts (b) Making the pH acidic from alkaline
 (c) Addition of heavy metal ions (d) **Addition of non-polar solvents**
80. Method for transferring protein to a nitrocellulose filter on which protein can be detected by a suitable probe is:
 (a) Southern blotting (b) Northern Blotting (c) **Western blotting** (d) None of these

UNIT V

81. Reason of lung cancer is

- (a) **Coal mining** (b) cement factory (c) calcium fluoride (d) bauxite mining

82. Blastoma is a cancer involving which tissue

- (a) Bones (b) connective tissue (c) epithelial cells **(d) embryonic tissue**

83. Which one of the following cancers does not form a solid neoplasm

- a) Leukemia** (b) lymphoma (c) lipoma (d) sarcoma

84. Oncogenes are the cancer causing genes in the cells but they do not express usually. This is because of the presence of

- (a) Proto oncogenes (b) tumor promoters
(c) Tumor suppressor genes (d) transposons or jumping genes

85. Differentiation potential of stem cells species

- (a) Stochastic differentiation (b) asymmetric replication **(c) potency** (d) self-renewal

86. Types of stem cells in mammals are

- (a) 2** (b) 3 (c) 4 (d) 5

87. Stem cells are present in

- (a) Unicellular organisms **(b) multicellular organisms** (c) non-living things (d) viruses

88. Process in which one stem cell develops into two differentiated daughter cells, another stem cell undergoes mitosis and produces two identical stem cells is called

- (a) Stochastic differentiation** (b) asymmetric replication (c) potency (d) self-renewal

89. In a developing embryo, stem cells can differentiate into

- (a) Ectoderm (b) endoderm (c) mesoderm **(d) all of above**

90. Multipotent stem cells can be derived from which of the following

- (a) Adipose tissue (fat) (b) Bone marrow (c) Umbilical cord blood **(d) All of the above**

91. Approximately what proportion of the public approves of stem cell research?

- (a) 30%** (b) 60% (c) 85% (d) 100%

92. To date, stem cell medicine has yielded proven therapies for which of the following illnesses

- (a) Alzheimer's disease (b) Breast cancer (c) Macular degeneration (d) None of the above

93. What is the main source of human Embryonic Stem Cells (hESC)

- (a) Umbilical cord blood
- (b) Early term aborted fetuses
- (c) Frozen embryos stored at fertility clinics, in excess of clinical need
- (d) Women who donate eggs solely for research purposes

94. Cancer is divided into

- (a) **4** (b) 5 (c) 6 (d) 8

95. Common anti-tumor drug will be employed to breast cancer

- (a) Ciprofloxacin (b) Amoxlyin (c) **Doxorubicin** (d) Paracetamol

96. What is the term used to indicate the growth of new blood vessels?

- (a) Biosynthesis (b) Angiogenesis (c) Apoptosis (d) Metastasis

97. Cancer cells are

- (a) BHK (b) Veo (c) HL-8 **(d) HeLa cells**

98. Cancer is caused by

- (a) **Uncontrolled mitosis** (b) uncontrolled meiosis
(c) Rupturing of cells (d) loss of immunity of the cells

99. Cancer of β lymphocytes is called

- (a) Sarcoma (b) Melanoma **(c) myeloma** (d) carcinoma

100. Diethylstilbestrol (DES) is a carcinogen. Which organ of the body does it affect?

- (a) **Vagina** (b) heart (c) lung (d) kidney

SECTION B

UNIT I

1. What is role of FDA and explain shortly.
2. How to predict the function of a drug for therapy.
3. Write few examples for bioinformatics tools in drug design.
4. What is GMP? Explain the safety measures in industry.
5. Demonstrate the shapes of nanoparticles and Write advantages of it
6. What is medicinal biotechnology? Explain shortly.
7. Write short introduction to the marketing in medical biotechnology.
8. Explain about pharmaceutical products in world wide.
9. Debate diagnostic methods in disease treatment shortly.
10. Give short notes on different types of therapeutic methods.

UNIT II

11. Debate new developments in medical technologies in short.
12. Exhibit the water purification technology in detail.
13. How do you produce pharmaceutical proteins through microorganisms?
14. What is vaccine? Write four names on it.
15. Explain about few antibiotic producing companies in the world.
16. Define the role of biotechnology in healthcare.
17. Write a short notes on enzyme producing companies worldwide.
18. Demonstrate the current affairs in disease resistance and susceptibility.
19. What are all the role of pharmaceutical products to the society?
20. Give about the clinical diagnostic methods in shortly.

UNIT III

21. Exhibit the criteria for the designing of successful vaccine.
22. How to produce viral vaccine? Write suitable example.
23. What is AIDS vaccine? Write suitable example.
24. How mini cells will acts as vaccine and Demonstrate it?
25. Give four application in genetic engineering.
26. What is vaccine technology?
27. Give notes on drawback of existing vaccines with suitable examples.
28. Debate about genetic engineering and its uses in society.
29. Tell four different types of highly pathogenic bacteria and its mode of infection.
30. Explain about the impact of genetic engineering in the world wide.

UNIT IV

31. What is therapeutic cloning? Write few examples.
32. Define about nanotechnology in healthcare in short.
33. What is mean by biomedical sciences?
34. Is green nano substances are ecofriendly?
35. What is gene delivery system?
36. Write short notes on recent developments in medical technology.
37. What are all the role of human proteins in immune system?
38. Explain about the pharming of human proteins in detail?
39. What is neutraceutical? Write few examples.
40. Debate the biomaterials will be used in the tissue replacement.

UNIT V

41. Define about stem cells.
42. What is mean by gene therapy?
43. Debate about the genetic engineering on stem cells.
44. Explain about cytotoxicity for prediction of anticancer activity.
45. Give short notes on drawback in gene therapy.
46. What is cancer? How it occurs?
47. What is mean by chemotherapy? Give few chemotherapeutic drugs.
48. How to diagnose cancer using biosensors? Write few examples.
49. What are all the stage of cancer and its aggressive ness?
50. Advances in cancer therapy and Write four examples.

SECTION C

UNIT I

51. Write detailed notes on regulatory measures in FDA.
52. What is drug design? How to design a new drug. Write detailed explanation.
53. Compare rational, combinational drugs in all kind of therapies.
54. Define briefly the benefits of computer aided drug design.
55. Debate antisense DNA technology in detail with suitable example.
56. Give a detailed explanation on advancements in medical biotechnology
57. Write detailed report on worldwide marketing and its strategies.
58. Compare traditional and modern medicine with suitable example in detail.
59. What are the advantage of modern medicine in healthcare sector in detail?
60. How FDA approves drug for therapeutic purpose? Write detailed explanations.

UNIT II

61. How biosensor are used in clinical diagnosis? Write few examples.
62. How to produce monoclonal antibodies using invitro.
63. What is polyclonal antibodies? Write detailed explanation with suitable examples.
64. Compare the monoclonal and polyclonal antibodies and its advantages in detail.
65. How the vaccine induces immune system? Write detailed explanation.
66. How to purify the drug? Write detailed process on it.
67. What are the new technologies in vaccine productions?
68. Explain about the types of vaccine in detail.
69. How do the pharmaceutical companies producing vaccines. Write in detail.
70. Write detailed examples for genetically engineered vaccines.

UNIT III

71. Demonstrate the flow chart for the auditing at pharmaceutical industry.
72. Write a detailed instrumentation for protein purification and preservation
73. Give brief application of viral vector vaccines.
74. How the pharmaceutical companies employing safety precaution on their industries.
75. What are all the impacts of genetic engineering on vaccine production?
76. What is peptide vaccine? Demonstrate the structures with suitable examples.
77. What is subunit vaccine? Give few names on subunit vaccines.
78. How the virus are used as vectors for treating of some diseases.
79. Define about chiral technology in detail.
80. Compare GLP, GMP practices in pharmaceutical industries in detail.

UNIT IV

81. Explain about characterization of nanoparticles in detail.
82. Write few examples of nano formulated medicine in the world.
83. How to replace the defective cell using nanotechnology.
84. Give detailed notes on biocompatibility of various nanoparticles.
85. Why the nano substance are toxic to human while treating. How?
86. How to prepare nano substance for treating of various diseases? Write detailed explanation.
87. Write detailed notes on application of nanotechnology in biomedical sciences.
88. Debate about tissue engineering and its advantages in tissue replacements.
89. Define about gene delivery using nano substance in detail.
90. Compare green, chemical and physical mediated nanoparticle synthesis in detail.

UNIT V

91. Retrieve and preservation of stem cells. Write few examples on it.
92. Drug screenings strategies in drug discovery.
93. Give detailed notes on anticancer drug and its side effects.
94. Write a detailed account of antioxidant assay for drug screening.
95. Define about the robotic technology in drug screening and toxicology on stem cells.
96. Why the cancer is being dangerous and different types of cancer
97. What is chemotherapy? Give an essay on it.
98. Write few side effects of radiation therapy in detail.
99. Advances in cancer detection using clinical methodologies in detail.
100. How do you characterize the stem cell using flow cytometry?

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QUESTION BANK



I-M.Sc. Biotechnology (2018-2020 batch)

SUBJECT CODE: 18PBT102

PAPER TITLE: Biostatistics and Bioinstrumentation

PG AND RESEARCH DEPARTMENT OF BIOTECHNOLOGY

NOVEMBER 2018

(Knowledge level K1 Remembering is followed in relation to course Outcomes specified as per Bloom's Taxonomy)

SECTION A (1 mark)

Choose the correct answer

UNIT-II

1. In statistics, distance or dispersion from central value is classified as
 - a) **Standard deviation**
 - b) sample variance
 - c) standard root
 - d) standard variance
2. If sample size is greater than or equal to 30 then sample standard deviation can be approximated to population standard deviation for the
 - a) Known standard deviation
 - b) unknown **standard deviation**
 - c) Standard interval deviation
 - d) population interval theorem
3. If arithmetic mean is considered as average of deviation then resultant measure is considered as
 - a) Close end deviation
 - b) mean **absolute deviation**
 - c) Mean deviation
 - d) variance
4. If positive square root is taken of population variance then calculated measure is transformed into
 - a) standard root
 - b) **Standard deviation**
 - c) Standard variance
 - d) sample variance
5. Relationship between correlation coefficient and coefficient determination is that
 - a) Both are unequal
 - b) **The coefficient determination is coefficient of correlation square**
 - c) Both are equal
 - d) Coefficient determination is square root of the coefficient of correlation
6. Measure which describes detailed characteristics of whole data set is classified as
 - a) **Average or central value**
 - b) positive skewed value
 - c) negative skewed value
 - d) positive extended value
7. A coefficient of correlation is computed to be -0.95 it means
 - a) Relationship between two variables is weak
 - b) Relationship between two variables is strong
 - c) Relationship between two variables is weak and negative
 - d) **Relationship between two variables is strong and negative**
8. The strength of the correlation between a set of independent variables X and a dependent variable Y is measured by
 - a) Coefficient of correlation
 - b) coefficient of determination
 - c) standard error of estimate
 - d) **all of these**

9. A regression line is a straight line which
- a) is parallel to one of the coordinate axes
 - b) Is 90° to one of the coordinate axes?
 - c) **Provides an relationship between two parameters**
 - d) Is correlation
10. Science without statistics and statistics without science bear no
- a) Root, shoot
 - b) **fruit, root**
 - c) fruit, shoot
 - d) flower, root
11. Measure in which sum of all observations divided by the number of observation
- a) Mean Deviation
 - b) Standard Deviation
 - c) **Arithmetic Mean**
 - d) Mode
12. The degree of perfect positive correlation is
- a) **+1**
 - b) -1
 - c) 0
 - d) -2
13. Arranging the given numbers in ascending order and then selecting exactly middle value.
- a) Mean
 - b) Average
 - c) **Median**
 - d) Mode
14. Which is the value of the observation which divides the data into two equal parts, when the data is arranged in ascending (or descending) order
- a) Mean
 - b) **Median**
 - c) Standard deviation
 - d) Mode
15. The observation that occurs most frequently
- a) Mean
 - b) Average
 - c) Median
 - d) **Mode**
16. The mean of five numbers is 30. If one number is excluded, their mean becomes 28. The excluded number is
- a) 28
 - b) 30
 - c) 35
 - d) **38**
17. Median of the following numbers: 4, 4, 5, 7, 6, 7, 7, 12, 3 is
- a) 4
 - b) 5
 - c) **6**
 - d) 7
18. Standard deviation is
- a) **square root of mean of squared deviation**
 - b) Average difference between items of distribution and mean of that series
 - c) Ignores 50% of extreme items
 - d) Represents of dispersion of sample mean around the total population mean

19. The application of statistical methods in biology is called

- a) **Biostatistics**
- b) Statistics *in vivo*
- c) Biocomputing
- d) Bioinformatics

20. Father of Biostatistics

- a) Fischer
- b) Karl Pearson
- c) Francis Bacon
- d) **Francis Galton**

UNIT-II

21. An independent t-test can be used to assess which of the following?

- a) **It assesses differences between two groups of participants**
- b) It assesses differences between scores obtained on two separate occasions from the same participants
- c) It assesses goodness of fit
- d) It assesses relationships between two interval data sets

22. Which is calculated by dividing the overall deviance square in the observed and expected frequencies by expected frequency

- a) t-test
- b) f-test
- c) **chi-square test**
- d) z-test

23. What is the alternative name for a repeated-measures t-test?

- a) Chi-squared test of difference
- b) A test
- c) **A paired-samples t-test**
- d) unrelated t-test

24. In which of the following cases could you use a paired-samples t-test?

- a) When assessing three groups or more
- b) **When comparing the same participants performance before and after training**
- c) When comparing men and women's scores
- d) When assessing relationships between two groups

25. Test to be applied when number of observations are less than 30 and variance is not known, is said to be

- a) z-test
- b) **t-test**
- c) f test
- d) Chi-square test

26. A sample of 100 people is drawn from population in which men and women are equal in frequency, what is expected value to have?

- a) 44,56
- b) 45,55
- c) **50,50**
- d) 60,40

27. If we are testing for the difference between the means of two related samples with samples of $n_1=20$ and $n_2=20$, the number of degrees of freedom is equal to

- a) 18
- b) **19**
- c) 38
- d) 39

28. The softwares used to analyse the biostatistical data

- a) R
- b) SPSS
- c) SAS
- d) **All the above**

29. The population frequency is equal to expected frequency
- a) Significantly difference
 - b) The data is not similar
 - c) Alternate hypothesis
 - d) **Null hypothesis**
30. If the calculated value is less than the expected value, null hypothesis is
- a) **Accepted**
 - b) rejected
 - c) significantly different
 - d) The data is not similar
31. If the calculated value is greater than the expected value, null hypothesis is
- a) Accepted
 - b) **rejected**
 - c) significantly not different
 - d) The data is similar
32. Chi square test depends on degree of freedom
- a) **True**
 - b) False
 - c) May be
 - d) Not confident
33. What are the two types of variance which can occur in your data?
- a) Experimenter and participant
 - b) Repeated and extraneous
 - c) Personal and interpersonal
 - d) **Between or within groups**
34. What do ANOVA calculate?
- a) **F ratios**
 - b) Z-scores
 - c) R ratios
 - d) T-sco
35. How many levels must there be in one independent variable for an ANOVA to be used?
- a) 5
 - b) 6
 - c) **3**
 - d) 2
36. How many dependent variables must you have for an ANOVA to be conducted?
- a) 3 ordinal variables
 - b) **Only 1 continuous variable**
 - c) 3 ratio variables
 - d) 2 nominal variables
37. Where would you look on an ANOVA output to determine if there is an overall significant difference?
- a) **The Sig. column of the ANOVA table**
 - b) Descriptive statistics box
 - c) Confidence intervals column
 - d) The Sig. column of the multiple comparisons
38. What would you use to determine whether significant differences were observed between all levels of your independent variable?
- a) F statistic
 - b) Confidence intervals
 - c) Histograms
 - d) **Post-hoc tests**
39. How many independent and dependent variables are there in a One-Way within Groups ANOVA?
- a) 2 independent and 1 dependent variable
 - b) **1 independent and 1 dependent variable**
 - c) 1 independent and 3 dependent variables
 - d) 1 independent and 2 dependent variable
40. How many dependent variables are there in a two-way ANOVA?
- a) 3
 - b) **1**
 - c) 4
 - d) 2

UNIT-III

41. What are the two general types of centrifuge devices for solid-liquid separations?

- a) Sedimentation centrifuges, filtering centrifuges
- b) Sedimentation centrifuges, decantation centrifuges
- c) Filtering centrifuges, sintering centrifuges
- d) Sedimentation centrifuges, two way centrifuges

Answer: a) Sedimentation centrifuges, filtering centrifuges

42. What is the use of tubular-bowl centrifuge?

- a) To separate soap from oil
- b) To separate waste material
- c) To separate cells and viruses from broth
- d) To separate salts from mixtures

Answer: c) To separate cells and viruses from broth

43. In which industry tubular-bowl centrifuge not used?

- a) Food industry
- b) Pharma industry
- c) Biochemical industry
- d) Metallurgical industry

Answer: d) Metallurgical industry

44. When is the basket-filtering centrifuge not used?

- a) Solids are main product
- b) Low cake moisture content
- c) High solid recovery desired
- d) High liquid recovery desired

Answer: d) High liquid recovery desired

45. Why are gravity separators not used in bioseparations?

- a) Because density differences are very large
- b) Because density differences are very small
- c) Because gravity separators are too small
- d) Because the cultures get damaged

Answer: b) Because density differences are very small

46. Calculate the sigma factor for the following operating conditions

Bowl length $L=0.1\text{m}$

Rotation rate $n=2000/\text{s}$

$R_0=0.02\text{m}$, $R_1=0.01\text{m}$

- a) 50
- b) 55
- c) 111
- d) 165

Answer: b) 55

47. Calculate the sigma factor for the following operating conditions

Bowl length $L=0.2\text{m}$

Rotation rate $n=2000/\text{s}$

$R_0=0.02\text{m}$, $R_1=0.01\text{m}$

- a) 50
- b) 55
- c) 111
- d) 165

Answer: c) 111

48. Calculate the sigma factor for the following operating conditions

Bowl length $L=0.3\text{m}$

Rotation rate $n=2000/\text{s}$

$R_0=0.02\text{m}$, $R_1=0.01\text{m}$

- a) 50
- b) 55
- c) 111
- d) 165

Answer: d) 165

49. Calculate the sigma factor for the following operating conditions

Bowl length $L=0.05\text{m}$

Rotation rate $n=2000/\text{s}$

$R_0=0.02\text{m}$, $R_1=0.01\text{m}$

- a) 27
- b) 55
- c) 111
- d) 165

Answer: a) 27

50. Calculate the sigma factor for the following operating conditions

Bowl length $L=0.1\text{m}$

Rotation rate $n=4000/\text{s}$

$R_0=0.02\text{m}$, $R_1=0.01\text{m}$

- a) 323
- b) 212
- c) 234
- d) 222

Answer: d) 222

51. In $500 \times g$, what does g represent in accordance to centrifugation?

- a) Gravitational force
- b) Centrifugal force is 500 times greater than earthly gravitational force
- c) Centrifugal force is 500 times less than earthly gravitational force
- d) Centrifugal force is 500 times same as that of earthly gravitational force

Answer: b) Centrifugal force is 500 times greater than earthly gravitational force

52. Which of the following is not a type of centrifugation?

- a) Hydro cyclone
- b) Tubular centrifuge
- c) Microfiltration
- d) Disk stack separator

Answer: c) Microfiltration

53. At what speed do you centrifuge blood?

- a) 2200-2500 RPM
- b) 3000-3200 RPM
- c) 1000-1500 RPM
- d) 4000 RPM

Answer: a) 2200-2500 RPM

54. Which of the following centrifugation is used to separate certain organelles from whole cell?

- a) Rate-zonal centrifugation
- b) Normal centrifugation
- c) Differential centrifugation
- d) Isopycnic centrifugation

Answer: c) Differential centrifugation

55. Which of the following is used as a media for density gradient?

- a) Agarose
- b) Ficoll
- c) Luria broth
- d) Propylene glycol

Answer: b) Ficoll

56. From the following which is the type of filtration centrifuge?

- a) Screen/scroll centrifuge
- b) Tubular centrifuge
- c) Decanter centrifuge
- d) Separator centrifuge

Answer: a) Screen/scroll centrifuge

57. Which of the following is used in uranium enrichment?

- a) Tubular centrifuge
- b) Disk-stack centrifuge
- c) Gas centrifuge
- d) Zippe-type centrifuge

Answer: c) Gas centrifuge

58. What is a rate-zonal centrifugation?

- a) Based on separation of particles by mass
- b) Based on separation of particles by density
- c) Based on separation of particles on solubility
- d) Based on separation of particles on size

Answer: d) Based on separation of particles on size

59. Beer Lambert's law gives the relation between which of the following?

- a) Reflected radiation and concentration
- b) Scattered radiation and concentration
- c) Energy absorption and concentration
- d) Energy absorption and reflected radiation

Answer: c) Energy absorption and concentration

60. In which of the following ways, absorption is related to transmittance?

- a) Absorption is the logarithm of transmittance
- b) Absorption is the reciprocal of transmittance
- c) Absorption is the negative logarithm of transmittance
- d) Absorption is a multiple of transmittance

Answer: c) Absorption is the negative logarithm of transmittance

UNIT-IV

61. Which of the following wavelength ranges is associated with UV spectroscopy?

- a) 0.8 - 500 μ m
- b) 400 - 100nm
- c) 380 - 750nm
- d) 0.01 - 10nm

Answer: b) 400 - 100nm

62. Which of the following compounds does not absorb light in the UV/visible spectrum?

- a) Aspirin
- b) Paracetamol

- c) Chloral hydrate
- d) Phenobarbitone

Answer: c) Chloral hydrate

63. In infrared spectroscopy which frequency range is known as the fingerprint region?

- a) 400 - 1400cm⁻¹
- b) 1400 - 900cm⁻¹
- c) 900 - 600cm⁻¹
- d) 600 - 250cm⁻¹

Answer: b) 1400 - 900cm⁻¹

64. In which region of the infrared spectrum would you expect to find a peak characteristic of a triple bond stretch?

- a) 4000 - 3000cm⁻¹
- b) 2500 - 2000cm⁻¹
- c) 2000 - 1500cm⁻¹
- d) 1500 - 750cm⁻¹

Answer: b) 2500 - 2000cm⁻¹

65. In a chromatographic separation, which of the following indices is most appropriate for the qualitative identification of a substance?

- a) Relative retention factor R_{rel}
- b) Retention factor R_f
- c) Retention time
- d) Resolution

Answer: b) Retention factor R_f

66. Which of the following techniques would be most useful to identify and quantify the presence of a known impurity in a drug substance?

- a) NMR
- b) MS
- c) IR
- d) HPLC

Answer: d) HPLC

67. Which of the following assays could not be performed by gas chromatography?

- a) Characterisation of volatile oils
- b) Measurement of drugs and metabolites in biological fluids
- c) Characterisation of raw materials for drug synthesis
- d) Analysis of intravenous sodium chloride infusion

Answer: d) Analysis of intravenous sodium chloride

infusion

68. In which region of the electromagnetic spectrum does an absorption at 600 nm come?

- a) Near -UV
- b) Infrared
- c) Vacuum-UV
- d) Visible

Answer: d) Visible

69. In which region of the electromagnetic spectrum does an absorption at 177 nm come?

- a) Near -UV
- b) Visible
- c) Infrared
- d) Vacuum-UV

Answer: d) Vacuum-UV

70. In which type of chromatography, the stationary phase held in a narrow tube and the mobile phase is forced through it under pressure?

- a) Column chromatography
- b) Planar chromatography
- c) Liquid chromatography
- d) Gas chromatography

Answer: a) Column chromatography

71. In chromatography, the stationary phase can be _____ supported on a solid.

- a) Solid or liquid
- b) Liquid or gas
- c) Solid only
- d) Liquid only

Answer: a) Solid or liquid

72. In chromatography, which of the following can the mobile phase be made of?

- a) Solid or liquid
- b) Liquid or gas
- c) Gas only
- d) Liquid only

Answer: b) Liquid or gas

73. Which of the following cannot be used as an adsorbent in Column adsorption chromatography?

- a) Magnesium oxide
- b) Silica gel
- c) Activated alumina
- d) Potassium permanganate

Answer: d) Potassium permanganate

74. Which of the following types of chromatography involves the separation of substances in a mixture over a 0.2mm thick layer of an adsorbent?

- a) Gas liquid
- b) Column
- c) Thin layer
- d) Paper

Answer: c) Thin layer

75. In Column chromatography, the stationary phase is made of _____ and the mobile phase is made of _____

- a) Solid, liquid
- b) Liquid, liquid
- c) Liquid, gas
- d) Solid, gas

Answer: a) Solid, liquid

76. In Thin layer chromatography, the stationary phase is made of _____ and the mobile phase is made of _____

- a) Solid, liquid
- b) Liquid, liquid
- c) Liquid, gas
- d) Solid, gas

Answer: a) Solid, liquid

77. In which of the following type of paper, chromatography does the mobile phase move horizontally over a circular sheet of paper?

- a) Ascending paper chromatography
- b) Descending paper chromatography
- c) Radial paper chromatography
- d) Ascending – descending chromatography

Answer: c) Radial paper chromatography

78. Liquid chromatography can be performed in which of the following ways?

- a) Only in columns
- b) Only on plane surfaces

- c) Either in columns or on plane surfaces
- d) Neither in columns nor on plane surfaces

Answer: c) Either in columns or on plane surfaces

79. Gas chromatography can be performed in which of the following ways?

- a) Only in columns
- b) Only on plane surfaces
- c) Either in columns or on plane surfaces
- d) Neither in columns nor on plane surfaces

Answer: a) Only in columns

80. In Gas-liquid phase chromatography, the stationary phase is composed of _____ and the mobile phase is made of _____

- a) Solid, liquid
- b) Liquid, liquid
- c) Liquid, gas
- d) Solid, gas

Answer: c) Liquid, gas

UNIT-V

81. Which technique separates charged particles using electric field?

- a) Hydrolysis
- b) Electrophoresis
- c) Protein synthesis
- d) Protein denaturing

Answer: b) Electrophoresis

82. Electrophoresis was developed by:

- a) Tswett
- b) Tsvedberg
- c) Tiselius
- d) Sanger

Answer: c) Tiselius

83. The speed of migration of ions in electric field depends upon:

- a) Shape and size of molecule
- b) Magnitude of charge and shape of molecule
- c) Magnitude of charge shape and mass of molecule
- d) Magnitude of charge and mass of molecule

Answer: b) Magnitude of charge and shape of

molecule

84. Which of the following statements is true about migration of biomolecules?
- a) The rate of migration is directly proportional to the resistance of medium
 - b) Rate of migration is directly proportional to current
 - c) Low voltage is used for separation of high mass molecules
 - d) Rate of migration is inversely proportional to current

Answer: b) Rate of migration is directly

proportional to current

85. What does the electrophoresis apparatus consist of?
- a) Gel, buffer chamber and fire pack
 - b) Buffer chamber and electrophoresis unit
 - c) Electrophoresis unit and gel separator
 - d) Power pack and electrophoresis unit

Answer: d) Power pack and electrophoresis unit

86. If proteins are separated according to their electrophoretic mobility then the type of electrophoresis is:
- a) SDS PAGE
 - b) Affinity Electrophoresis
 - c) Electro focusing
 - d) Free flow electrophoresis

Answer: a) SDS PAGE

87. The electrophoretic mobility denoted as μ is mathematically expressed as:
- a) VE
 - b) E/V
 - c) 1/EV
 - d) V/E

Answer: d) V/E

88. Which of the following factors does not influence electrophoretic mobility?
- a) Molecular weight
 - b) Shape of molecule
 - c) Size of molecule
 - d) Stereochemistry of molecule

Answer: d) Stereochemistry of molecule

89. When is electrophoresis not used?
- a) Separation of proteins
 - b) Separation of amino acids
 - c) Separation of Lipids
 - d) Separation of nucleic acids

Answer: c) Separation of Lipids

90. What cannot be a reason for using electrophoresis?

- a) Comparing two sets of DNA
- b) Organizing DNA by shape of backbone
- c) Organizing DNA fragments from largest to smallest
- d) Organizing DNA in order we can see

Answer: b) Organizing DNA by shape of backbone

91. Which of the following cannot be used for the separation of nucleic acids?

- a) SDS – PAGE
- b) PAGE
- c) Northern blotting
- d) PAGE

Answer: a) SDS – PAGE

92. The polymerization of the gel used in PAGE occurs between polyacrylamide with

- a) N, N – acrylamide
- b) Bisacrylamide
- c) N – methyleneacrylamide
- d) N, N – methylene bisacrylamide

Answer: b) Bisacrylamide

93. If DNA is digested by endonucleases in four sites giving rise to fragments of which two are equal in length how many bands would be seen after electrophoresis?

- a) 3
- b) 4
- c) 5
- d) 6

Answer: b) 4

94. The fluorescent dye such Ethidium is used for visualizing DNA. How ethidium do binds to DNA?

- a) Stacked between histone molecules
- b) Binds to the nucleotide base
- c) Intercalated between the stacked bases
- d) Binds to the phosphodiester backbone

Answer: c) Intercalated between the stacked bases

95. Pulse field gel electrophoresis separates DNA molecules of size _____

- a) 10 – 20 bp
- b) 20 – 30 Kb
- c) 30 – 50 Kb
- d) 40 – 50 bp

Answer: c) 30 – 50 Kb

96. Which of the following will migrate faster? The condition is the molecular weight of the following is equal.

- a) Supercoiled circular DNA
- b) Nicked circular DNA
- c) Single stranded DNA
- d) Double stranded DNA

Answer: a) Supercoiled circular DNA

97. Agarose can be extracted from which of the following?

- a) Gracilaria esculentus
- b) Lycasusican esculentum
- c) Ficum benghalensis
- d) Agrostis stolonifera

Answer: a) Gracilaria esculentus

98. Electrophoresis cannot be used to separate _____

- a) DNA
- b) RNA
- c) Amino acid
- d) Protein

Answer: c) Amino acid

99. Which of the following is not a character of polyacrylamide gel?

- a) Inert
- b) Ionic strength
- c) Stable over a wide range of pH
- d) Separate upto a few 100 bp of DNA

Answer: d) Separate upto a few 100 bp of DNA

100. Sequence of which of the following cannot be determined using the Maxam Gilbert method?

- a) Bacteria
- b) Plants
- c) Bacteriophage T7
- d) Plasmid

Answer: c) Bacteriophage T7

(Knowledge levels K2 –Understanding, K3 –Applying, K4 Analysing, and K5-Evaluating are followed in relation to Course outcome specified as per Bloom’s Taxonomy)

SECTION B (5 marks)

UNIT I

1. Analyse the median from the following data

X	10	20	30	80	90	100
f	3	7	6	2	8	4

2. Calculate the Karl Pearson coefficient correlation of the following data

X	68	75	90	75	50	62	40	35
Y	10	12	14	10	10	13	9	8

3. In different years, the number of students in various faculties in a college is as follows. Represent the data with help of a suitable diagram.

Year	No. of Students			
	Arts	Science	Commerce	Law
1969-70	1200	800	400	300
1970-71	1100	900	500	400
1971-72	900	1200	350	550

4. Write a paragraph on the diagrammatic representations such as Scale diagram, line diagram, Histogram.

5. Find the mean from the following data using assumed mean method:

Marks	0-10	10-20	20-30	30-40	40-50	50-60
<i>No. Of Students</i>	42	44	58	35	26	15

6. Define median. Obtain the median with the help of formula and write merits and demerits of it.

. From the given data, calculate the value of mode by grouping method:

Marks (X)	1	2	3	4	5	6	7	8	9	10	11	12
No.Of students (Y)	4	7	8	12	16	14	9	7	17	5	3	2

8. Calculate standard deviation from the given data by indirect method:

S. No	: 1	2	3	4	5	6	7	8	9	10
Size	20	22	27	30	31	32	35	40	45	48

9. Compute mean and variance of the data set given below:

X	31-35	36-40	41-45	46-50	51-55	56-60	61-65	66-70
Y	2	3	8	12	16	5	2	2

10. For the given data, find the two regression equations without taking deviations from the arithmetic mean

A	10	12	13	14	15	19	22
B	8	9	12	14	13	15	16

UNIT-II

11. Two types of drugs are used for the following patients for reducing their blood pressure. Is there a significant difference in the efficiency of the two drugs at 5% level?

X	6	2	10	4	8
Y	9	11	7	8	7

12. The weight of 10 guinea pigs (in grams) when brought in the laboratory and after one month were recorded in the following table. Calculate and conclude whether the gain in weight is statistically significant or not at 1% level.

Guinea Pigs	Weight (in gms)									
In the beginning	49	41	37	41	42	37	39	38	41	35
After one month	52	43	46	52	46	38	42	41	42	38

13. What is the difference between paired t test and independent t test?

14. Write about the applications of R software for statistical analysis.

15. Give the uses of SPSS software in biostatistical analysis.

16. Write about the steps involved in chi square test.
17. Write about the applications of chi square test in solving Genetic phenotypic ratio.
18. Write about the applications of ANOVA in biostatistics.
19. How to design an experiment?
- 20 . What is the difference between the use of an ANOVA and chisquare test?

UNIT-III

21. What is the principle behind centrifugation?
22. What is centrifugation technique?
23. What is the purpose of centrifugation?
24. What are the uses of centrifugation?
25. What is ultracentrifugation technique?
26. What is zonal centrifugation?
27. What is the modern application of ultracentrifugation?
28. What is the difference between a spectrometer and a spectrophotometer?
29. How does the UV VIS spectroscopy works?
30. What is the difference between colorimeter and spectrophotometer?

UNIT-IV

31. How does a TEM microscope work?
32. What cell organelle can be viewed under a light microscope?
33. What is a phase contrast microscope and what is it used for?
34. What are the advantages and disadvantages of phase contrast microscope?
35. Why is green light used in phase contrast microscopy?
36. What is chromatography and how does it work?
37. What is the main purpose of chromatography?
38. What are the four types of chromatography?
39. What is the principle of HPLC?
40. What is the difference between a transmission and scanning electron microscope?

UNIT-V

41. What is the role of a Dideoxynucleotide in DNA sequencing?
42. What does Sanger sequencing do?
43. What is the importance of DNA sequencing?
44. How long does it take to sequence a human genome 2018?
45. What are the benefits of genome sequencing?
46. What is the difference between genotyping and sequencing?
47. What is PCR genotyping?
48. What is SNP analysis used for?
49. How does the polymerase chain reaction work?
50. What determines the sequence of nucleotides?

SECTION C (8 mark)

UNIT-I

1. Calculate Karl Pearson's correlation coefficient for the following data;

X	8	3	9	2	7	7	7	3	9	2
Y	9	5	10	1	5	10	5	10	4	2

2. Describe dispersion. How the spread of a distribution is measured? Explain range, variance, mean deviation and standard deviation.

3. Write about the use of Graphical and diagrammatic representations such as Scale diagram, line diagram, Histogram in biostatistics.

4. How many types of central tendencies are used in statistics? Describe the relationship between mean, median and mode.

5. Evaluate the standard deviation of the given data :

Size	3	4	5	6	7	8	9
Frequency	3	7	22	60	85	32	8

6. Calculate the median and mode (grouping method) for the distribution of the weights of 150 guinea pigs from the data given below:

Weight in Kg	30-40	40-50	50-60	60-70	70-80	80-90
Frequency	18	37	45	27	15	8

7. The production of butter fat during 7 consecutive days was recorded for 200 cows and the frequency distribution is given below. Calculate mean, median and mode.

Butter fat(in Kgs)	3.5-4.0	4.0-4.5	4.5-5.0	5.0-5.5	5.5-6.0	6.0-6.5	6.5-7.0	7.0-7.5
No. of Cows	4	60	50	36	30	10	5	2

8. Explain in detail about regression of Y on X and X on Y.

9. For five patients, temperature (X) and pulse (Y) are given. Calculate Karl Pearson's correlation.

Temp. (X)	102	101	100	99	98	97	96	95
Pulse (Y)	100	90	80	70	65	60	55	50

10 Calculate mean, standard deviation and coefficient of variation for the following data;

X	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Y	4	6	20	40	45	37	21	9	5

UNIT-II

11.Explain about ANOVA and its significance.

12. How to design an experiment for statistical analysis.

13. How would you illustrate the Chi-square test with an example?

14. Explicit about the use of SPSS software for statistical analysis.

15. Two independent samples of 8 and 7 items gave the following values; examine whether the difference between the means of the two samples is significant at 5% level.

A	9	11	13	11	15	9	12	14
B	10	12	10	14	9	8	10	

16. In a clinical treatment, the patients were checked to see the effect of a potential hypertensive drug. The 50 patients were assigned to receive active drug and other 50 as placebo at random. The response to treatment was categorized as favorable and unfavorable. Test the hypothesis that drug has a significant effect at 0.05.

Treatment	Response		Total
	Unfavourable	Favourable	
Placebo	41	09	50
Drug	16	34	50
	57	43	100

17. Explain about the use of R software for statistical analysis.

18. Explain about the formula used for the paired t test and independent t test?

19. The trait for smooth peas (R) is dominant over wrinkled peas (r) and yellow pea colour (Y) is dominant to green (y). A dihybrid cross between two heterozygous pea plants is performed ($RrYy \times RrYy$). The following phenotypic frequencies are observed:

701 smooth yellow peas ; 204 smooth green peas ; 243 wrinkled yellow peas ; 68 wrinkled green peas . Use the chi-squared test to determine if these results are due to independent assortment.

20. In sweet pea plants, the trait for purple flowers (P) is dominant to the trait for red flowers (p). Similarly, the trait for long pollen (L) is dominant to the trait for round pollen (l).

Two heterozygotes are crossed, yielding the following frequencies for the F1 generation:

296 purple, long plants ; 19 purple, round plants ; 27 red, long plants ; 85 red, round plants.
Use the chi-squared test to determine if these results are due to independent assortment.

UNIT-III

21. Why are different speeds of centrifugation used?
22. What is the principle of centrifugation technique?
23. What is the application of centrifugation?
24. What is the principle of UV-Visible Spectrophotometer? What are the components of a spectrophotometer?
25. What is a UV-VIS spectrophotometer used for?
26. What is the function of a spectrophotometer?
27. What is IR spectroscopy principle?
28. What is the Beer Lambert law used for?
29. How does frequency relate to wavelength?
30. What is a NMR spectrophotometer and what does it work?

UNIT-IV

31. What is electrophoresis and its types and applications?
32. What is the purpose of electrophoresis and what does it do?
33. How does gel electrophoresis identify proteins?
34. How does PFGE work? Give detailed note on Application of PFGE?
35. What are the types of electrophoresis?
36. What physical property determines how the DNA moves the gel?
37. What are the three main steps in the PCR process?
38. Why is the sequence of nucleotides so important? Explain with suitable diagram.
39. Give detailed note on HPLC in identification of phytochemical percentage in plant extract.
40. What are the type of chromatography in protein separation?

UNIT-V

41. What are next generation sequencing techniques?
42. How does the *Maxam–Gilbert sequencing* method work?
43. How does ELISA help in detection of disease?
44. What is the difference between direct and indirect Elisa? Explain with suitable diagrammatic reactions.
45. What can you see with an electron microscope? How it is work?
46. How does a phase contrast microscope work?
47. How does the Sanger sequencing method work?
48. What is difference between SNP and mutation?
49. What are the types of DNA sequencing? Explain with suitable examples.
50. Why are Dideoxynucleotides used in DNA sequencing?

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QUESTION BANK



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SUBJECT CODE: 19PBT102

PAPER TITLE: Biostatistics and Bioinstrumentation

PG AND RESEARCH DEPARTMENT OF BIOTECHNOLOGY

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(Knowledge level K1 Remembering is followed in relation to course Outcomes specified as per Bloom's Taxonomy)

SECTION A (1 mark)

Choose the correct answer

UNIT-II

1. In statistics, distance or dispersion from central value is classified as
 - a) **Standard deviation**
 - b) sample variance
 - c) standard root
 - d) standard variance
2. If sample size is greater than or equal to 30 then sample standard deviation can be approximated to population standard deviation for the
 - a) Known standard deviation
 - b) unknown **standard deviation**
 - c) Standard interval deviation
 - d) population interval theorem
3. If arithmetic mean is considered as average of deviation then resultant measure is considered as
 - a) Close end deviation
 - b) mean **absolute deviation**
 - c) Mean deviation
 - d) variance
4. If positive square root is taken of population variance then calculated measure is transformed into
 - a) Standard root
 - b) **Standard deviation**
 - c) Standard variance
 - d) sample variance
5. Relationship between correlation coefficient and coefficient determination is that
 - a) Both are unequal
 - b) **The coefficient determination is coefficient of correlation square**
 - c) Both are equal
 - d) Coefficient determination is square root of the coefficient of correlation
6. Measure which describes detailed characteristics of whole data set is classified as
 - a) **Average or central value**
 - b) positive skewed value
 - c) Negative skewed value
 - d) positive extended value
7. A coefficient of correlation is computed to be -0.95 it means
 - a) Relationship between two variables is weak
 - b) Relationship between two variables is strong
 - c) Relationship between two variables is weak and negative
 - d) **Relationship between two variables is strong and negative**
8. The strength of the correlation between a set of independent variables X and a dependent variable Y is measured by
 - a) Coefficient of correlation
 - b) coefficient of determination
 - c) standard error of estimate
 - d) **all of these**

9. A regression line is a straight line which
- a) is parallel to one of the coordinate axes
 - b) Is 90° to one of the coordinate axes?
 - c) **Provides an relationship between two parameters**
 - d) Is correlation
10. Science without statistics and statistics without science bear no
- a) Root, shoot
 - b) **fruit, root**
 - c) fruit, shoot
 - d) flower, root
11. Measure in which sum of all observations divided by the number of observation
- a) Mean Deviation
 - b) Standard Deviation
 - c) **Arithmetic Mean**
 - d) Mode
12. The degree of perfect positive correlation is
- a) **+1**
 - b) -1
 - c) 0
 - d) -2
13. Arranging the given numbers in ascending order and then selecting exactly middle value.
- a) Mean
 - b) Average
 - c) **Median**
 - d) Mode
14. Which is the value of the observation which divides the data into two equal parts, when the data is arranged in ascending (or descending) order
- a) Mean
 - b) **Median**
 - c) Standard deviation
 - d) Mode
15. The observation that occurs most frequently
- a) Mean
 - b) Average
 - c) Median
 - d) **Mode**
16. The mean of five numbers is 30. If one number is excluded, their mean becomes 28. The excluded number is
- a) 28
 - b) 30
 - c) 35
 - d) **38**
17. Median of the following numbers: 4, 4, 5, 7, 6, 7, 7, 12, 3 is
- a) 4
 - b) 5
 - c) **6**
 - d) 7
18. Standard deviation is
- a) **square root of mean of squared deviation**
 - b) Average difference between items of distribution and mean of that series
 - c) Ignores 50% of extreme items
 - d) Represents of dispersion of sample mean around the total population mean

19. The application of statistical methods in biology is called

- a) **Biostatistics**
- b) Statistics *in vivo*
- c) Biocomputing
- d) Bioinformatics

20. Father of Biostatistics

- a) Fischer
- b) Karl Pearson
- c) Francis Bacon
- d) **Francis Galton**

UNIT-II

21. An independent t-test can be used to assess which of the following?

- a) **It assesses differences between two groups of participants**
- b) It assesses differences between scores obtained on two separate occasions from the same participants
- c) It assesses goodness of fit
- d) It assesses relationships between two interval data sets

22. Which is calculated by dividing the overall deviance square in the observed and expected frequencies by expected frequency

- a) t-test
- b) f-test
- c) **chi-square test**
- d) z-test

23. What is the alternative name for a repeated-measures t-test?

- a) Chi-squared test of difference
- b) A test
- c) **A paired-samples t-test**
- d) unrelated t-test

24. In which of the following cases could you use a paired-samples t-test?

- a) When assessing three groups or more
- b) **When comparing the same participants performance before and after training**
- c) When comparing men and women's scores
- d) When assessing relationships between two groups

25. Test to be applied when number of observations are less than 30 and variance is not known, is said to be

- a) z-test
- b) **t-test**
- c) f test
- d) Chi-square test

26. A sample of 100 people is drawn from population in which men and women are equal in frequency, what is expected value to have?

- a) 44,56
- b) 45,55
- c) **50,50**
- d) 60,40

27. If we are testing for the difference between the means of two related samples with samples of $n_1=20$ and $n_2=20$, the number of degrees of freedom is equal to

- a) 18
- b) **19**
- c) 38
- d) 39

28. The softwares used to analyse the biostatistical data

- a) R
- b) SPSS
- c) SAS
- d) **All the above**

29. The population frequency is equal to expected frequency
- a) Significantly difference
 - b) The data is not similar
 - c) Alternate hypothesis
 - d) **Null hypothesis**
30. If the calculated value is less than the expected value, null hypothesis is
- a) **Accepted**
 - b) rejected
 - c) significantly different
 - d) The data is not similar
31. If the calculated value is greater than the expected value, null hypothesis is
- a) Accepted
 - b) **rejected**
 - c) significantly not different
 - d) The data is similar
32. Chi square test depends on degree of freedom
- a) **True**
 - b) False
 - c) May be
 - d) Not confident
33. What are the two types of variance which can occur in your data?
- a) Experimenter and participant
 - b) Repeated and extraneous
 - c) Personal and interpersonal
 - d) **Between or within groups**
34. What do ANOVA calculate?
- a) **F ratios**
 - b) Z-scores
 - c) R ratios
 - d) T-sco
35. How many levels must there be in one independent variable for an ANOVA to be used?
- a) 5
 - b) 6
 - c) **3**
 - d) 2
36. How many dependent variables must you have for an ANOVA to be conducted?
- a) 3 ordinal variables
 - b) **Only 1 continuous variable**
 - c) 3 ratio variables
 - d) 2 nominal variables
37. Where would you look on an ANOVA output to determine if there is an overall significant difference?
- a) **The Sig. column of the ANOVA table**
 - b) Descriptive statistics box
 - c) Confidence intervals column
 - d) The Sig. column of the multiple comparisons
38. What would you use to determine whether significant differences were observed between all levels of your independent variable?
- a) F statistic
 - b) Confidence intervals
 - c) Histograms
 - d) **Post-hoc tests**
39. How many independent and dependent variables are there in a One-Way within Groups ANOVA?
- a) 2 independent and 1 dependent variable
 - b) **1 independent and 1 dependent variable**
 - c) 1 independent and 3 dependent variables
 - d) 1 independent and 2 dependent variable
40. How many dependent variables are there in a two-way ANOVA?
- a) 3
 - b) **1**
 - c) 4
 - d) 2

UNIT-III

41. What are the two general types of centrifuge devices for solid-liquid separations?

- a) Sedimentation centrifuges, filtering centrifuges
- b) Sedimentation centrifuges, decantation centrifuges
- c) Filtering centrifuges, sintering centrifuges
- d) Sedimentation centrifuges, two way centrifuges

Answer: a) Sedimentation centrifuges, filtering centrifuges

42. What is the use of tubular-bowl centrifuge?

- a) To separate soap from oil
- b) To separate waste material
- c) To separate cells and viruses from broth
- d) To separate salts from mixtures

Answer: c) To separate cells and viruses from broth

43. In which industry tubular-bowl centrifuge not used?

- a) Food industry
- b) Pharma industry
- c) Biochemical industry
- d) Metallurgical industry

Answer: d) Metallurgical industry

44. When is the basket-filtering centrifuge not used?

- a) Solids are main product
- b) Low cake moisture content
- c) High solid recovery desired
- d) High liquid recovery desired

Answer: d) High liquid recovery desired

45. Why are gravity separators not used in bioseparations?

- a) Because density differences are very large
- b) Because density differences are very small
- c) Because gravity separators are too small
- d) Because the cultures get damaged

Answer: b) Because density differences are very small

46. Calculate the sigma factor for the following operating conditions

Bowl length $L=0.1\text{m}$

Rotation rate $n=2000/\text{s}$

$R_0=0.02\text{m}$, $R_1=0.01\text{m}$

- a) 50
- b) 55
- c) 111
- d) 165

Answer: b) 55

47. Calculate the sigma factor for the following operating conditions

Bowl length $L=0.2\text{m}$

Rotation rate $n=2000/\text{s}$

$R_0=0.02\text{m}$, $R_1=0.01\text{m}$

- a) 50
- b) 55
- c) 111
- d) 165

Answer: c) 111

48. Calculate the sigma factor for the following operating conditions

Bowl length $L=0.3\text{m}$

Rotation rate $n=2000/\text{s}$

$R_0=0.02\text{m}$, $R_1=0.01\text{m}$

- a) 50
- b) 55
- c) 111
- d) 165

Answer: d) 165

49. Calculate the sigma factor for the following operating conditions

Bowl length $L=0.05\text{m}$

Rotation rate $n=2000/\text{s}$

$R_0=0.02\text{m}$, $R_1=0.01\text{m}$

- a) 27
- b) 55
- c) 111
- d) 165

Answer: a) 27

50. Calculate the sigma factor for the following operating conditions

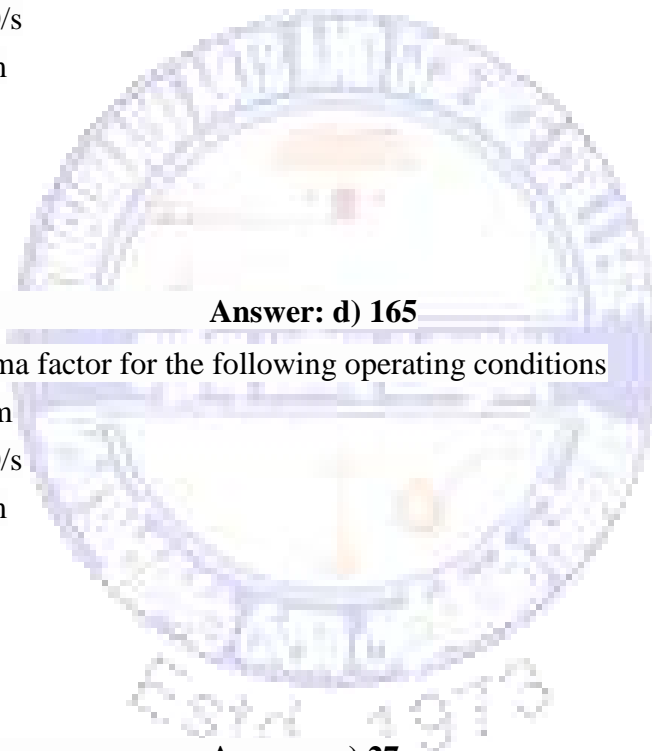
Bowl length $L=0.1\text{m}$

Rotation rate $n=4000/\text{s}$

$R_0=0.02\text{m}$, $R_1=0.01\text{m}$

- a) 323
- b) 212
- c) 234
- d) 222

Answer: d) 222



51. In $500 \times g$, what does g represent in accordance to centrifugation?

- a) Gravitational force
- b) Centrifugal force is 500 times greater than earthly gravitational force
- c) Centrifugal force is 500 times less than earthly gravitational force
- d) Centrifugal force is 500 times same as that of earthly gravitational force

Answer: b) Centrifugal force is 500 times greater than earthly gravitational force

52. Which of the following is not a type of centrifugation?

- a) Hydro cyclone
- b) Tubular centrifuge
- c) Microfiltration
- d) Disk stack separator

Answer: c) Microfiltration

53. At what speed do you centrifuge blood?

- a) 2200-2500 RPM
- b) 3000-3200 RPM
- c) 1000-1500 RPM
- d) 4000 RPM

Answer: a) 2200-2500 RPM

54. Which of the following centrifugation is used to separate certain organelles from whole cell?

- a) Rate-zonal centrifugation
- b) Normal centrifugation
- c) Differential centrifugation
- d) Isopycnic centrifugation

Answer: c) Differential centrifugation

55. Which of the following is used as a media for density gradient?

- a) Agarose
- b) Ficoll
- c) Luria broth
- d) Propylene glycol

Answer: b) Ficoll

56. From the following which is the type of filtration centrifuge?

- a) Screen/scroll centrifuge
- b) Tubular centrifuge
- c) Decanter centrifuge
- d) Separator centrifuge

Answer: a) Screen/scroll centrifuge

57. Which of the following is used in uranium enrichment?

- a) Tubular centrifuge
- b) Disk-stack centrifuge
- c) Gas centrifuge
- d) Zippe-type centrifuge

Answer: c) Gas centrifuge

58. What is a rate-zonal centrifugation?

- a) Based on separation of particles by mass
- b) Based on separation of particles by density
- c) Based on separation of particles on solubility
- d) Based on separation of particles on size

Answer: d) Based on separation of particles on size

59. Beer Lambert's law gives the relation between which of the following?

- a) Reflected radiation and concentration
- b) Scattered radiation and concentration
- c) Energy absorption and concentration
- d) Energy absorption and reflected radiation

Answer: c) Energy absorption and concentration

60. In which of the following ways, absorption is related to transmittance?

- a) Absorption is the logarithm of transmittance
- b) Absorption is the reciprocal of transmittance
- c) Absorption is the negative logarithm of transmittance
- d) Absorption is a multiple of transmittance

Answer: c) Absorption is the negative logarithm of transmittance

UNIT-IV

61. Which of the following wavelength ranges is associated with UV spectroscopy?

- a) 0.8 - 500 μ m
- b) 400 - 100nm
- c) 380 - 750nm
- d) 0.01 - 10nm

Answer: b) 400 - 100nm

62. Which of the following compounds does not absorb light in the UV/visible spectrum?

- a) Aspirin
- b) Paracetamol
- c) Chloral hydrate
- d) Phenobarbitone

Answer: c) Chloral hydrate

63. In infrared spectroscopy which frequency range is known as the fingerprint region?

- a) 400 - 1400cm⁻¹
- b) 1400 - 900cm⁻¹
- c) 900 - 600cm⁻¹
- d) 600 - 250cm⁻¹

Answer: b) 1400 - 900cm⁻¹

64. In which region of the infrared spectrum would you expect to find a peak characteristic of a triple bond stretch?

- a) 4000 - 3000cm⁻¹
- b) 2500 - 2000cm⁻¹
- c) 2000 - 1500cm⁻¹
- d) 1500 - 750cm⁻¹

Answer: b) 2500 - 2000cm⁻¹

65. In a chromatographic separation, which of the following indices is most appropriate for the qualitative identification of a substance?

- a) Relative retention factor R_{rel}
- b) Retention factor R_f
- c) Retention time
- d) Resolution

Answer: b) Retention factor R_f

66. Which of the following techniques would be most useful to identify and quantify the presence of a known impurity in a drug substance?

- a) NMR
- b) MS
- c) IR
- d) HPLC

Answer: d) HPLC

67. Which of the following assays could not be performed by gas chromatography?

- a) Characterisation of volatile oils
- b) Measurement of drugs and metabolites in biological fluids
- c) Characterisation of raw materials for drug synthesis
- d) Analysis of intravenous sodium chloride infusion

Answer: d) Analysis of intravenous sodium chloride

infusion

68. In which region of the electromagnetic spectrum does an absorption at 600 nm come?

- a) Near -UV
- b) Infrared
- c) Vacuum-UV
- d) Visible

Answer: d) Visible

69. In which region of the electromagnetic spectrum does an absorption at 177 nm come?

- a) Near -UV
- b) Visible
- c) Infrared
- d) Vacuum-UV

Answer: d) Vacuum-UV

70. In which type of chromatography, the stationary phase held in a narrow tube and the mobile phase is forced through it under pressure?

- a) Column chromatography
- b) Planar chromatography
- c) Liquid chromatography
- d) Gas chromatography

Answer: a) Column chromatography

71. In chromatography, the stationary phase can be _____ supported on a solid.

- a) Solid or liquid
- b) Liquid or gas
- c) Solid only
- d) Liquid only

Answer: a) Solid or liquid

72. In chromatography, which of the following can the mobile phase be made of?

- a) Solid or liquid
- b) Liquid or gas

- c) Gas only
- d) Liquid only

Answer: b) Liquid or gas

73. Which of the following cannot be used as an adsorbent in Column adsorption chromatography?

- a) Magnesium oxide
- b) Silica gel
- c) Activated alumina
- d) Potassium permanganate

Answer: d) Potassium permanganate

74. Which of the following types of chromatography involves the separation of substances in a mixture over a 0.2mm thick layer of an adsorbent?

- a) Gas liquid
- b) Column
- c) Thin layer
- d) Paper

Answer: c) Thin layer

75. In Column chromatography, the stationary phase is made of _____ and the mobile phase is made of _____

- a) Solid, liquid
- b) Liquid, liquid
- c) Liquid, gas
- d) Solid, gas

Answer: a) Solid, liquid

76. In Thin layer chromatography, the stationary phase is made of _____ and the mobile phase is made of _____

- a) Solid, liquid
- b) Liquid, liquid
- c) Liquid, gas
- d) Solid, gas

Answer: a) Solid, liquid

77. In which of the following type of paper, chromatography does the mobile phase move horizontally over a circular sheet of paper?

- a) Ascending paper chromatography
- b) Descending paper chromatography

- c) Radial paper chromatography
- d) Ascending – descending chromatography

Answer: c) Radial paper chromatography

78. Liquid chromatography can be performed in which of the following ways?

- a) Only in columns
- b) Only on plane surfaces
- c) Either in columns or on plane surfaces
- d) Neither in columns nor on plane surfaces

Answer: c) Either in columns or on plane surfaces

79. Gas chromatography can be performed in which of the following ways?

- a) Only in columns
- b) Only on plane surfaces
- c) Either in columns or on plane surfaces
- d) Neither in columns nor on plane surfaces

Answer: a) Only in columns

80. In Gas-liquid phase chromatography, the stationary phase is composed of _____ and the mobile phase is made of _____

- a) Solid, liquid
- b) Liquid, liquid
- c) Liquid, gas
- d) Solid, gas

Answer: c) Liquid, gas

UNIT-V

81. Which technique separates charged particles using electric field?

- a) Hydrolysis
- b) Electrophoresis
- c) Protein synthesis
- d) Protein denaturing

Answer: b) Electrophoresis

82. Electrophoresis was developed by:

- a) Tswett
- b) Tsvedberg
- c) Tiselius
- d) Sanger

Answer: c) Tiselius

83. The speed of migration of ions in electric field depends upon:

- a) Shape and size of molecule

- b) Magnitude of charge and shape of molecule
- c) Magnitude of charge shape and mass of molecule
- d) Magnitude of charge and mass of molecule

Answer: b) Magnitude of charge and shape of molecule

84. Which of the following statements is true about migration of biomolecules?

- a) The rate of migration is directly proportional to the resistance of medium
- b) Rate of migration is directly proportional to current
- c) Low voltage is used for separation of high mass molecules
- d) Rate of migration is inversely proportional to current

Answer: b) Rate of migration is directly proportional to current

85. What does the electrophoresis apparatus consist of?

- a) Gel, buffer chamber and fire pack
- b) Buffer chamber and electrophoresis unit
- c) Electrophoresis unit and gel separator
- d) Power pack and electrophoresis unit

Answer: d) Power pack and electrophoresis unit

86. If proteins are separated according to their electrophoretic mobility then the type of electrophoresis is:

- a) SDS PAGE
- b) Affinity Electrophoresis
- c) Electro focusing
- d) Free flow electrophoresis

Answer: a) SDS PAGE

87. The electrophoretic mobility denoted as μ is mathematically expressed as:

- a) VE
- b) E/V
- c) $1/EV$
- d) V/E

Answer: d) V/E

88. Which of the following factors does not influence electrophoretic mobility?

- a) Molecular weight
- b) Shape of molecule
- c) Size of molecule
- d) Stereochemistry of molecule

Answer: d) Stereochemistry of molecule

89. When is electrophoresis not used?

- a) Separation of proteins
- b) Separation of amino acids
- c) Separation of Lipids
- d) Separation of nucleic acids

Answer: c) Separation of Lipids

90. What cannot be a reason for using electrophoresis?

- a) Comparing two sets of DNA
- b) Organizing DNA by shape of backbone
- c) Organizing DNA fragments from largest to smallest
- d) Organizing DNA in order we can see

Answer: b) Organizing DNA by shape of backbone

91. Which of the following cannot be used for the separation of nucleic acids?

- a) SDS – PAGE
- b) PAGE
- c) Northern blotting
- d) PAGE

Answer: a) SDS – PAGE

92. The polymerization of the gel used in PAGE occurs between polyacrylamide with

- a) N, N – acrylamide
- b) Bisacrylamide
- c) N – methyleneacrylamide
- d) N, N – methylene bisacrylamide

Answer: b) Bisacrylamide

93. If DNA is digested by endonucleases in four sites giving rise to fragments of which two are equal in length how many bands would be seen after electrophoresis?

- a) 3
- b) 4
- c) 5
- d) 6

Answer: b) 4

94. The fluorescent dye such Ethidium is used for visualizing DNA. How ethidium do binds to DNA?

- a) Stacked between histone molecules
- b) Binds to the nucleotide base
- c) Intercalated between the stacked bases
- d) Binds to the phosphodiester backbone

Answer: c) Intercalated between the stacked bases

95. Pulse field gel electrophoresis separates DNA molecules of size _____

- a) 10 – 20 bp
- b) 20 – 30 Kb
- c) 30 – 50 Kb
- d) 40 – 50 bp

Answer: c) 30 – 50 Kb

96. Which of the following will migrate faster? The condition is the molecular weight of the following is equal.

- a) Supercoiled circular DNA
- b) Nicked circular DNA
- c) Single stranded DNA
- d) Double stranded DNA

Answer: a) Supercoiled circular DNA

97. Agarose can be extracted from which of the following?

- a) Gracilaria esculentus
- b) Lycasusican esculentum
- c) Ficum benghalensis
- d) Agrostis stolonifera

Answer: a) Gracilaria esculentus

98. Electrophoresis cannot be used to separate _____

- a) DNA
- b) RNA
- c) Amino acid
- d) Protein

Answer: c) Amino acid

99. Which of the following is not a character of polyacrylamide gel?

- a) Inert
- b) Ionic strength
- c) Stable over a wide range of pH
- d) Separate upto a few 100 bp of DNA

Answer: d) Separate upto a few 100 bp of DNA

100. Sequence of which of the following cannot be determined using the Maxam Gilbert method?

- a) Bacteria
- b) Plants
- c) Bacteriophage T7
- d) Plasmid

Answer: c) Bacteriophage T7

(Knowledge levels K2 –Understanding, K3 –Applying, K4 Analysing, and K5-Evaluating are followed in relation to Course outcome specified as per Bloom’s Taxonomy)

SECTION B (5 marks)

UNIT I

1. Analyse the median from the following data

X	10	20	30	80	90	100
f	3	7	6	2	8	4

2. Calculate the Karl Pearson coefficient correlation of the following data

X	68	75	90	75	50	62	40	35
Y	10	12	14	10	10	13	9	8

3. In different years, the number of students in various faculties in a college is as follows. Represent the data with help of a suitable diagram.

Year	No. of Students			
	Arts	Science	Commerce	Law
1969-70	1200	800	400	300
1970-71	1100	900	500	400
1971-72	900	1200	350	550

4. Write a paragraph on the diagrammatic representations such as Scale diagram, line diagram, Histogram.

5. Find the mean from the following data using assumed mean method:

Marks	0-10	10-20	20-30	30-40	40-50	50-60
<i>No. Of Students</i>	42	44	58	35	26	15

6. Define median. Obtain the median with the help of formula and write merits and demerits of it.

. From the given data, calculate the value of mode by grouping method:

Marks (X)	1	2	3	4	5	6	7	8	9	10	11	12
No.Of students (Y)	4	7	8	12	16	14	9	7	17	5	3	2

8. Calculate standard deviation from the given data by indirect method:

S. No	: 1	2	3	4	5	6	7	8	9	10
Size	20	22	27	30	31	32	35	40	45	48

9. Compute mean and variance of the data set given below:

X	31-35	36-40	41-45	46-50	51-55	56-60	61-65	66-70
Y	2	3	8	12	16	5	2	2

10. For the given data, find the two regression equations without taking deviations from the arithmetic mean

A	10	12	13	14	15	19	22
B	8	9	12	14	13	15	16

UNIT-II

11. Two types of drugs are used for the following patients for reducing their blood pressure. Is there a significant difference in the efficiency of the two drugs at 5% level?

X	6	2	10	4	8
Y	9	11	7	8	7

12. The weight of 10 guinea pigs (in grams) when brought in the laboratory and after one month were recorded in the following table. Calculate and conclude whether the gain in weight is statistically significant or not at 1% level.

Guinea Pigs	Weight (in gms)									
In the beginning	49	41	37	41	42	37	39	38	41	35
After one month	52	43	46	52	46	38	42	41	42	38

13. What is the difference between paired t test and independent t test?

14. Write about the applications of R software for statistical analysis.

15. Give the uses of SPSS software in biostatistical analysis.

16. Write about the steps involved in chi square test.

17. Write about the applications of chi square test in solving Genetic phenotypic ratio.

18. Write about the applications of ANOVA in biostatistics.

19. How to design an experiment?

20. What is the difference between the use of an ANOVA and chisquare test?

UNIT-III

21. What is the principle behind centrifugation?
22. What is centrifugation technique?
23. What is the purpose of centrifugation?
24. What are the uses of centrifugation?
25. What is ultracentrifugation technique?
26. What is zonal centrifugation?
27. What is the modern application of ultracentrifugation?
28. What is the difference between a spectrometer and a spectrophotometer?
29. How does the UV VIS spectroscopy works?
30. What is the difference between colorimeter and spectrophotometer?

UNIT-IV

31. How does a TEM microscope work?
32. What cell organelle can be viewed under a light microscope?
33. What is a phase contrast microscope and what is it used for?
34. What are the advantages and disadvantages of phase contrast microscope?
35. Why is green light used in phase contrast microscopy?
36. What is chromatography and how does it work?
37. What is the main purpose of chromatography?
38. What are the four types of chromatography?
39. What is the principle of HPLC?
40. What is the difference between a transmission and scanning electron microscope?

UNIT-V

41. What is the role of a Dideoxynucleotide in DNA sequencing?
42. What does Sanger sequencing do?
43. What is the importance of DNA sequencing?
44. How long does it take to sequence a human genome using nano probe sequence?
45. What are the benefits of genome sequencing?
46. What is the difference between genotyping and sequencing?
47. What is PCR genotyping?
48. What is SNP analysis used for?
49. How does the polymerase chain reaction work?
50. What determines the sequence of nucleotides?

SECTION C (8 mark)

UNIT-I

1. Calculate Karl Pearson's correlation coefficient for the following data;

X	8	3	9	2	7	7	7	3	9	2
Y	9	5	10	1	5	10	5	10	4	2

2. Describe dispersion. How the spread of a distribution is measured? Explain range, variance, mean deviation and standard deviation.

3. Write about the use of Graphical and diagrammatic representations such as Scale diagram, line diagram, Histogram in biostatistics.

4. How many types of central tendencies are used in statistics? Describe the relationship between mean, median and mode.

5. Evaluate the standard deviation of the given data :

Size	3	4	5	6	7	8	9
Frequency	3	7	22	60	85	32	8

6. Calculate the median and mode (grouping method) for the distribution of the weights of 150 guinea pigs from the data given below:

Weight in Kg	30-40	40-50	50-60	60-70	70-80	80-90
Frequency	18	37	45	27	15	8

7. The production of butter fat during 7 consecutive days was recorded for 200 cows and the frequency distribution is given below. Calculate mean, median and mode.

Butter fat(in Kgs)	3.5-4.0	4.0-4.5	4.5-5.0	5.0-5.5	5.5-6.0	6.0-6.5	6.5-7.0	7.0-7.5
No. of Cows	4	60	50	36	30	10	5	2

8. Explain in detail about regression of Y on X and X on Y.

9. For five patients, temperature (X) and pulse (Y) are given. Calculate Karl Pearson's correlation.

Temp. (X)	102	101	100	99	98	97	96	95
Pulse (Y)	100	90	80	70	65	60	55	50

10 Calculate mean, standard deviation and coefficient of variation for the following data;

X	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Y	4	6	20	40	45	37	21	9	5

UNIT-II

11.Explain about ANOVA and its significance.

12. How to design an experiment for statistical analysis.

13. How would you illustrate the Chi-square test with an example?

14. Explicit about the use of SPSS software for statistical analysis.

15. Two independent samples of 8 and 7 items gave the following values; examine whether the difference between the means of the two samples is significant at 5% level.

A	9	11	13	11	15	9	12	14
B	10	12	10	14	9	8	10	

16. In a clinical treatment, the patients were checked to see the effect of a potential hypertensive drug. The 50 patients were assigned to receive active drug and other 50 as placebo at random. The response to treatment was categorized as favorable and unfavorable. Test the hypothesis that drug has a significant effect at 0.05.

Treatment	Response		Total
	Unfavourable	Favourable	
Placebo	41	09	50
Drug	16	34	50
	57	43	100

17. Explain about the use of R software for statistical analysis.

18. Explain about the formula used for the paired t test and independent t test?

19. The trait for smooth peas (R) is dominant over wrinkled peas (r) and yellow pea colour (Y) is dominant to green (y). A dihybrid cross between two heterozygous pea plants is performed ($RrYy \times RrYy$). The following phenotypic frequencies are observed: 701 smooth yellow peas; 204 smooth green peas; 243 wrinkled yellow peas; 68 wrinkled green peas. Use the chi-squared test to determine if these results are due to independent assortment.

20. In sweet pea plants, the trait for purple flowers (P) is dominant to the trait for red flowers (p). Similarly, the trait for long pollen (L) is dominant to the trait for round pollen (l).

Two heterozygotes are crossed, yielding the following frequencies for the F1 generation: 296 purple, long plants; 19 purple, round plants; 27 red, long plants; 85 red, round plants. Use the chi-squared test to determine if these results are due to independent assortment.

UNIT-III

21. Why are different speeds of centrifugation used?
22. What is the principle of centrifugation technique?
23. What is the application of centrifugation?
24. What is the principle of UV-Visible Spectrophotometer? What are the components of a spectrophotometer?
25. What is a UV-VIS spectrophotometer used for?
26. What is the function of a spectrophotometer?
27. What is IR spectroscopy principle?
28. What is the Beer Lambert law used for?
29. How does frequency relate to wavelength?
30. What is a NMR spectrophotometer and what does it work?

UNIT-IV

31. What is electrophoresis and its types and applications?
32. What is the purpose of electrophoresis and what does it do?
33. How does gel electrophoresis identify proteins?
34. How does PFGE work? Give detailed note on Application of PFGE?
35. What are the types of electrophoresis?
36. What physical property determines how the DNA moves the gel?
37. What are the three main steps in the PCR process?
38. Why is the sequence of nucleotides so important? Explain with suitable diagram.
39. Give detailed note on HPLC in identification of phytochemical percentage in plant extract.
40. What are the type of chromatography in protein separation?

UNIT-V

41. What are next generation sequencing techniques?
42. How does the *Maxam-Gilbert sequencing* method work?
43. How does ELISA help in detection of disease?
44. What is the difference between direct and indirect Elisa? Explain with suitable diagrammatic reactions.
45. What can you see with an electron microscope? How it is work?
46. How does a phase contrast microscope work?
47. How does the Sanger sequencing method work?
48. What is difference between SNP and mutation?
49. What are the types of DNA sequencing? Explain with suitable examples.
50. Why are Dideoxynucleotides used in DNA sequencing?

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QUESTION BANK



I-B.Sc. Biotechnology (2019-2022 batch)

SUBJECT CODE: 19UBT102

PAPER TITLE: Bioinstrumentation and Environmental Biotechnology

PG AND RESEARCH DEPARTMENT OF BIOTECHNOLOGY

NOVEMBER 2019

(Knowledge level K1 Remembering is followed in relation to course Outcomes specified as per Bloom's Taxonomy)

SECTION A (1 mark)

Choose the correct answer

UNIT-III

1. pH meters can be considered as voltage sources with which of the following internal resistances?

- a) Very low resistance
- b) Moderate resistance
- c) Very high resistance
- d) No resistance

Answer: a) Very high resistance

2. The electrodes used in pH measurement have which of the following internal resistances?

- a) Very low resistance
- b) Moderate resistance
- c) Very high resistance
- d) No resistance

Answer: a) Very high resistance

3. Which of the following is the simplest of pH meters?

- a) Null-detector type pH meter
- b) Direct reading type pH meter
- c) Digital pH meter
- d) Modern pH meter

Answer: a) Null-detector type pH meter

4. Which of the following can be used to provide automatic temperature compensation?

- a) Proper insulation
- b) Calibration for different temperatures
- c) Thermistor
- d) Thermometer

Answer: c) Thermistor

5. Which of the following is not the characteristic of direct reading type pH meters?

- a) Simple operation
- b) Quick to use
- c) Continuous indication output
- d) It requires balancing process

Answer: d) It requires balancing process

6. What are the two general types of centrifuge devices for solid-liquid separations?

- a) Sedimentation centrifuges, filtering centrifuges
- b) Sedimentation centrifuges, decantation centrifuges
- c) Filtering centrifuges, sintering centrifuges
- d) Sedimentation centrifuges, two way centrifuges

Answer: a) Sedimentation centrifuges, filtering centrifuges

7. What is the use of tubular-bowl centrifuge?

- a) To separate soap from oil
- b) To separate waste material
- c) To separate cells and viruses from broth
- d) To separate salts from mixtures

Answer: c) To separate cells and viruses from broth

8. In which industry tubular-bowl centrifuge not used?

- a) Food industry
- b) Pharma industry
- c) Biochemical industry
- d) Metallurgical industry

Answer: d) Metallurgical industry

9. When is the basket-filtering centrifuge not used?

- a) Solids are main product
- b) Low cake moisture content
- c) High solid recovery desired
- d) High liquid recovery desired

Answer: d) High liquid recovery desired

10. Why are gravity separators not used in bioseparations?

- a) Because density differences are very large
- b) Because density differences are very small
- c) Because gravity separators are too small
- d) Because the cultures get damaged

Answer: b) Because density differences are very small

11. Which of the following is not a type of centrifugation?

- a) Hydro cyclone
- b) Tubular centrifuge
- c) Microfiltration
- d) Disk stack separator

Answer: c) Microfiltration

12. At what speed do you centrifuge blood?

- a) 2200-2500 RPM
- b) 3000-3200 RPM
- c) 1000-1500 RPM
- d) 4000 RPM

Answer: a) 2200-2500 RPM

13. Which of the following centrifugation is used to separate certain organelles from whole cell?

- a) Rate-zonal centrifugation
- b) Normal centrifugation
- c) Differential centrifugation
- d) Isopycnic centrifugation

Answer: c) Differential centrifugation

14. Which of the following is used as a media for density gradient?

- a) Agarose
- b) Ficoll
- c) Luria broth
- d) Propylene glycol

Answer: b) Ficoll

15. From the following which is the type of filtration centrifuge?

- a) Screen/scroll centrifuge
- b) Tubular centrifuge
- c) Decanter centrifuge
- d) Separator centrifuge

Answer: a) Screen/scroll centrifuge

16. Which of the following is used in uranium enrichment?

- a) Tubular centrifuge
- b) Disk-stack centrifuge
- c) Gas centrifuge
- d) Zippe-type centrifuge

Answer: c) Gas centrifuge

17. What is a rate-zonal centrifugation?

- a) Based on separation of particles by mass
- b) Based on separation of particles by density
- c) Based on separation of particles on solubility
- d) Based on separation of particles on size

Answer: d) Based on separation of particles on size

18. Which of the following is used in electron microscope?

- a) Electron beams
- b) Magnetic fields
- c) Light waves
- d) Electron beams and magnetic fields

Answer: electron beams and magnetic fields

19. Electron Microscope can give a magnification up to _____

- a) 400,000X
- b) 100,000X
- c) 15000X
- d) 100X

Answer: 400,000X

20. Where do we obtain the magnified image of the specimen in SEM?

- a) cathode ray tube
- b) phosphorescent screen
- c) anode
- d) scanning generator

Answer: cathode ray tube

UNIT-11

21. Beer Lambert's law gives the relation between which of the following?

- a) Reflected radiation and concentration
- b) Scattered radiation and concentration
- c) Energy absorption and concentration
- d) Energy absorption and reflected radiation

Answer: c) Energy absorption and concentration

22. In which of the following ways, absorption is related to transmittance?

- a) Absorption is the logarithm of transmittance
- b) Absorption is the reciprocal of transmittance
- c) Absorption is the negative logarithm of transmittance
- d) Absorption is a multiple of transmittance

Answer: c) Absorption is the negative logarithm of transmittance

23. Which of the following wavelength ranges is associated with UV spectroscopy?

- a) 0.8 - 500 μ m
- b) 400 - 100nm
- c) 380 - 750nm
- d) 0.01 - 10nm

Answer: b) 400 - 100nm

24. Which of the following compounds does not absorb light in the UV/visible spectrum?

- a) Aspirin
- b) Paracetamol
- c) Chloral hydrate
- d) Phenobarbitone

Answer: c) Chloral hydrate

25. In infrared spectroscopy which frequency range is known as the fingerprint region?

- a) 400 - 1400cm⁻¹
- b) 1400 - 900cm⁻¹
- c) 900 - 600cm⁻¹
- d) 600 - 250cm⁻¹

Answer: b) 1400 - 900cm⁻¹

26. In which region of the infrared spectrum would you expect to find a peak characteristic of a triple bond stretch?

- a) 4000 - 3000cm⁻¹
- b) 2500 - 2000cm⁻¹
- c) 2000 - 1500cm⁻¹
- d) 1500 - 750cm⁻¹

Answer: b) 2500 - 2000cm⁻¹

27. In which region of the electromagnetic spectrum does an absorption at 600 nm come?

- a) Near -UV
- b) Infrared
- c) Vacuum-UV
- d) Visible

Answer: d) Visible

28. In which region of the electromagnetic spectrum does an absorption at 177 nm come?

- a) Near -UV
- b) Visible
- c) Infrared
- d) Vacuum-UV

Answer: d) Vacuum-UV

29. 1. What is the wavelength range for UV spectrum of light?

- a) 400 nm – 700 nm
- b) 700 nm to 1 mm

- c) 0.01 nm to 10 nm
- d) 10 nm to 400 nm

Answer: d) 10 nm to 400 nm

30. Beer's law states that the intensity of light decreases with respect to _____

- a) Concentration
- b) Distance
- c) Composition
- d) Volume

Answer: a) Concentration

31. Lambert's law states that the intensity of light decreases with respect to _____

- a) Concentration
- b) Distance
- c) Composition
- d) Volume

Answer: b) Distance

32. In which region of the electromagnetic spectrum does an absorption at 600 nm come?

- a) Vacuum-UV.
- b) Near -UV.
- c) Infrared.
- d) Visible.

Answer: d) Visible

33. What type of technique is FTIR spectroscopy?

- a) A dispersive technique?
- b) An emission technique
- c) An absorbance technique
- d) A UV-Vis technique

Answer: c) An absorbance technique

34. How is the wavelength controlled in an FTIR spectrometer?

- a) By a Michelson Interferometer
- b) By a computer
- c) By a laser
- d) By calibration with a standard sample

Answer: c) By a laser

35. What occurs when the moving mirror in an FTIR spectrometer is the same distance from the beamsplitter as the static mirror?

- a) Constructive interference
- b) Destructive interference
- c) Radio interference
- d) The spectrum is measured

Answer: a) Constructive interference

36. What occurs when a molecule absorbs infrared radiation?

- a) It warms up
- b) It flies around
- c) It spins faster
- d) It vibrates faster

Answer: d) It vibrates faster

37. Which of the following main component of mass spectroscopy deal with resolving the ions into their characteristics mass components according to their mass-to-charge ratio?

- a) Ion Source
- b) Analyzer
- c) Detector System
- d) Analyzer tube

Answer: b) Analyzer

38. Who discovered the mass spectrometer?

- a) Francis Aston
- b) J. J Thomson
- c) Ernest O. Lawrence
- d) Walter Kaufmann

Answer: b) J. J Thomson

38. In which state of matter mass spectroscopy is being performed?

- a) Solid
- b) Liquid
- c) Gaseous
- d) Plasma

Answer: c) Gaseous

39. Which species of the following is used to bombard with the sample for which mass spectroscopy has been performed?

- a) Alpha particles
- b) Neutrons
- c) Electrons
- d) Protons

Answer: d) Protons

40. In Flame emission photometers, the measurement of _____ is used for qualitative analysis.

- a) Colour
- b) Intensity
- c) Velocity
- d) Frequency

Answer: a) Colour

UNIT-III

41. Chromatography is a physical method that is used to separate and analyse _____

- a) Simple mixtures
- b) Complex mixtures
- c) Viscous mixtures
- d) Metals

Answer: b) Complex mixtures

42. In which type of chromatography, the stationary phase held in a narrow tube and the mobile phase is forced through it under pressure?

- a) Column chromatography
- b) Planar chromatography
- c) Liquid chromatography
- d) Gas chromatography

Answer: a) Column chromatography

43. In chromatography, the stationary phase can be _____ supported on a solid.

- a) Solid or liquid
- b) Liquid or gas
- c) Solid only
- d) Liquid only

Answer: a) Solid or liquid

44. In chromatography, which of the following can the mobile phase be made of?

- a) Solid or liquid

- b) Liquid or gas
- c) Gas only
- d) Liquid only

Answers: b) Liquid or gas

45. 10. In Thin layer chromatography, the stationary phase is made of _____ and the mobile phase is made of _____

- a) Solid, liquid
- b) Liquid, liquid
- c) Liquid, gas
- d) Solid, gas

Answer: a) Solid, liquid

46. In a chromatographic separation, which of the following indices is most appropriate for the qualitative identification of a substance?

- a) Relative retention factor R_{rel}
- b) Retention factor R_f
- c) Retention time
- d) Resolution

Answer: b) Retention factor R_f

47. Which of the following techniques would be most useful to identify and quantify the presence of a known impurity in a drug substance?

- a) NMR
- b) MS
- c) IR
- d) HPLC

Answer: d) HPLC

48. Which of the following assays could not be performed by gas chromatography?

- a) Characterisation of volatile oils
- b) Measurement of drugs and metabolites in biological fluids
- c) Characterisation of raw materials for drug synthesis
- d) Analysis of intravenous sodium chloride infusion

Answer: d) Analysis of intravenous sodium chloride

infusion

49. In which type of chromatography, the stationary phase held in a narrow tube and the mobile phase is forced through it under pressure?

- a) Column chromatography
- b) Planar chromatography

- c) Liquid chromatography
- d) Gas chromatography

Answer: a) Column chromatography

50. In chromatography, the stationary phase can be _____ supported on a solid.

- a) Solid or liquid
- b) Liquid or gas
- c) Solid only
- d) Liquid only

Answer: a) Solid or liquid

51. In chromatography, which of the following can the mobile phase be made of?

- a) Solid or liquid
- b) Liquid or gas
- c) Gas only
- d) Liquid only

Answer: b) Liquid or gas

52. Which of the following cannot be used as an adsorbent in Column adsorption chromatography?

- a) Magnesium oxide
- b) Silica gel
- c) Activated alumina
- d) Potassium permanganate

Answer: d) Potassium permanganate

53. Which of the following types of chromatography involves the separation of substances in a mixture over a 0.2mm thick layer of an adsorbent?

- a) Gas liquid
- b) Column
- c) Thin layer
- d) Paper

Answer: c) Thin layer

54. In Column chromatography, the stationary phase is made of _____ and the mobile phase is made of _____

- a) Solid, liquid
- b) Liquid, liquid
- c) Liquid, gas
- d) Solid, gas

Answer: a) Solid, liquid

55. In Thin layer chromatography, the stationary phase is made of _____ and the mobile phase is made of _____

- a) Solid, liquid
- b) Liquid, liquid
- c) Liquid, gas
- d) Solid, gas

Answer: a) Solid, liquid

56. In which of the following type of paper, chromatography does the mobile phase move horizontally over a circular sheet of paper?

- a) Ascending paper chromatography
- b) Descending paper chromatography
- c) Radial paper chromatography
- d) Ascending – descending chromatography

Answer: c) Radial paper chromatography

57. Liquid chromatography can be performed in which of the following ways?

- a) Only in columns
- b) Only on plane surfaces
- c) Either in columns or on plane surfaces
- d) Neither in columns nor on plane surfaces

Answer: c) Either in columns or on plane surfaces

58. Gas chromatography can be performed in which of the following ways?

- a) Only in columns
- b) Only on plane surfaces
- c) Either in columns or on plane surfaces
- d) Neither in columns nor on plane surfaces

Answer: a) Only in columns

59. In Gas-liquid phase chromatography, the stationary phase is composed of _____ and the mobile phase is made of _____

- a) Solid, liquid
- b) Liquid, liquid
- c) Liquid, gas
- d) Solid, gas

Answer: c) Liquid, gas

60. Which of the following types of chromatography involves the process, where the mobile phase moves through the stationary phase by the influence of gravity or capillary action?

- a) Column Chromatography
- b) High Pressure Liquid Chromatography
- c) Gas Chromatography
- d) Planar Chromatography

Answer: d) Planar Chromatography

UNIT-IV

62. Which technique separates charged particles using electric field?

- a) Hydrolysis
- b) Electrophoresis
- c) Protein synthesis
- d) Protein denaturing

Answer: b) Electrophoresis

62. Electrophoresis was developed by:

- a) Tswett
- b) Tsvedberg
- c) Tiselius
- d) Sanger

Answer: c) Tiselius

63. The speed of migration of ions in electric field depends upon:

- a) Shape and size of molecule
- b) Magnitude of charge and shape of molecule
- c) Magnitude of charge shape and mass of molecule
- d) Magnitude of charge and mass of molecule

Answer: b) Magnitude of charge and shape of

molecule

64. Which of the following statements is true about migration of biomolecules?

- a) The rate of migration is directly proportional to the resistance of medium
- b) Rate of migration is directly proportional to current
- c) Low voltage is used for separation of high mass molecules
- d) Rate of migration is inversely proportional to current

Answer: b) Rate of migration is directly proportional to current

65. What does the electrophoresis apparatus consist of?

- a) Gel, buffer chamber and fire pack
- b) Buffer chamber and electrophoresis unit
- c) Electrophoresis unit and gel separator
- d) Power pack and electrophoresis unit

Answer: d) Power pack and electrophoresis unit

66. If proteins are separated according to their electrophoretic mobility then the type of electrophoresis is:

- a) SDS PAGE
- b) Affinity Electrophoresis
- c) Electro focusing
- d) Free flow electrophoresis

Answer: a) SDS PAGE

67. The electrophoretic mobility denoted as μ is mathematically expressed as:

- a) VE
- b) E/V
- c) 1/EV
- d) V/E

Answer: d) V/E

68. Which of the following factors does not influence electrophoretic mobility?

- a) Molecular weight
- b) Shape of molecule
- c) Size of molecule
- d) Stereochemistry of molecule

Answer: d) Stereochemistry of molecule

69. When is electrophoresis not used?

- a) Separation of proteins
- b) Separation of amino acids
- c) Separation of Lipids
- d) Separation of nucleic acids

Answer: c) Separation of Lipids

70. What cannot be a reason for using electrophoresis?

- a) Comparing two sets of DNA
- b) Organizing DNA by shape of backbone
- c) Organizing DNA fragments from largest to smallest
- d) Organizing DNA in order we can see

Answer: b) Organizing DNA by shape of backbone

71. Which of the following cannot be used for the separation of nucleic acids?

- a) SDS – PAGE

- b) PAGE
- c) Northern blotting
- d) PAGE

Answer: a) SDS – PAGE

72. The polymerization of the gel used in PAGE occurs between polyacrylamide with

- a) N, N – acrylamide
- b) Bisacrylamide
- c) N – methyleneacrylamide
- d) N, N – methylene bisacrylamide

Answer: b) Bisacrylamide

73. If DNA is digested by endonucleases in four sites giving rise to fragments of which two are equal in length how many bands would be seen after electrophoresis?

- a) 3
- b) 4
- c) 5
- d) 6

Answer: b) 4

74. The fluorescent dye such Ethidium is used for visualizing DNA. How ethidium do binds to DNA?

- a) Stacked between histone molecules
- b) Binds to the nucleotide base
- c) Intercalated between the stacked bases
- d) Binds to the phosphodiester backbone

Answer: c) Intercalated between the stacked bases

75. Pulse field gel electrophoresis separates DNA molecules of size _____

- a) 10 – 20 bp
- b) 20 – 30 Kb
- c) 30 – 50 Kb
- d) 40 – 50 bp

Answer: c) 30 – 50 Kb

76. Which of the following will migrate faster? The condition is the molecular weight of the following is equal.

- a) Supercoiled circular DNA
- b) Nicked circular DNA
- c) Single stranded DNA
- d) Double stranded DNA

Answer: a) Supercoiled circular DNA

77. Agarose can be extracted from which of the following?

- a) Gracilaria esculentus
- b) Lycasusican esculentum
- c) Ficum benghalensis
- d) Agrostis stolonifera

Answer: a) Gracilaria esculentus

78. Electrophoresis cannot be used to separate _____

- a) DNA
- b) RNA
- c) Amino acid
- d) Protein

Answer: c) Amino acid

79. Which of the following is not a character of polyacrylamide gel?

- a) Inert
- b) Ionic strength
- c) Stable over a wide range of pH
- d) Separate upto a few 100 bp of DNA

Answer: d) Separate upto a few 100 bp of DNA

80. Sequence of which of the following cannot be determined using the Maxam Gilbert method?

- a) Bacteria
- b) Plants
- c) Bacteriophage T7
- d) Plasmid

Answer: c) Bacteriophage T7

UNIT-V

81. Chlorella pyrenoidosa is usually found in

- a) Sludge digestion tank
- b) Trickling filter
- c) Oxidation pond
- d) Activated sludge process

Answer: b) Trickling filter

82. BOD can be measured during third and fifth date respectively at the temperature of

- a) 20⁰ C and 27⁰C
- b) 25⁰ C and 27⁰C
- c) 20⁰ C and 25⁰C
- d) 27⁰ C and 37⁰C

Answer: a) 20⁰ C and 27⁰C

83. MLSS is

- a) Mixed liquor suspended solids
- b) Mixed liquor solid substrate
- c) Minimum liquid of suspended solid
- d) Mixed liquor solid salt

Answer: a) Mixed liquor suspended solids

84. The depth of rock in the trickling filter varies from

- a) 3-8 ft
- b) 8-10 ft
- c) 2-10 ft
-) None of the above

Answer: a) 3-8 ft

85. PCR is

- a) Polymerase chain reaction
- b) Packed column reactor
- c) Packed cylinder reactor
- d) Packed bed reactor

Answer: b) Packed column reactor

86. Sludge granulation is done in

- a) Activated sludge process
- b) UASB
- c) Trickling filter
- d) Fluidised bed reactor

Answer: b) UASB

87. Identify the irrelevant match

- a) Effluent treatment – Trickling filter
- b) Sewage water treatment – Oxidation Pond
- c) Saline soils – Carbonates and Bicarbonates
- d) Alkaline soils – Chloride and Sulphate ions

Answer: Saline soils – Carbonates and Bicarbonates

88. Sludge and slurry is a

- a) Solid waste
- b) Liquid waste
- c) Solid and liquid waste**
- d) Liquid and solid waste

Answer: c) Solid and liquid waste

89. Eutrophication is due to

- a) Organic waste
- b) Inorganic wastes
- c) Algal blooms
- d) Microbes

Answer: a) Organic waste

90. COD involves the oxidation of organics using

- a) Potassium dichromate**
- b) Sulphuric acid
- c) Silver sulphate
- d) All the above

Answer: a) Potassium dichromate

91. The municipal waste and excreta are composted into

- a) Night soil compost
- b) Black compost
- c) Litter compost
- d) Vermin cast

Answer: a) Night soil compost

92. The spent slurry of biogas digester is

- a) Made into compost or manure
- b) Reusable for biogas production
- c) Used as a disinfectant
- d) Used as carrier in biofertilizer production.

Answer: a) Made into compost or manure.

93. The main problem associated with solid waste management is

- a) Segregation**
- b) Moisture content
- c) Waste quantity
- d) Heavy metals

Answer: a) Segregation

94. Organism involved in metal corrosion is

- a) Pseudomonas
- b) Thiobacillus
- c) Clostridium
- d) Bacillus

Answer: b) Thiobacillus

95. Biosorption is a/an

- a) **Active process**
- b) Passive process
- c) Both a and b
- d) None

Answer: a) Active process

96. Which among the following is bioremediation?

- a) Accumulation of toxins
- b) Elimination of toxins
- c) Toxins are converted to inactive forms
- d) None of the above

Answer: d) None of the above

97. Protein produced from earth worm is

- a) **Vermitin**
- b) Peroxidase
- c) Cellulase
- d) Amylase

Answer: a) Vermitin

98. The ideal pH for vermicomposting is

- a) **6.5 –7.5**
- b) 7-8
- c) 4-5
- d) 5-6

Answer: a) 6.5 –7.5

99. Worm casts are used as

- a) **Bio fertilizer**
- b) Biomanure
- c) Package material
- d) Enzyme source

Answer: a) Bio fertilizer

100. Plastics can be biodegraded using

- a) Amylase
- b) Peroxidase
- c) **Lipase**
- d) None of the above

Answer: c) Lipase

(Knowledge levels K2 –Understanding, K3 –Applying, K4 Analysing, and K5-Evaluating are followed in relation to Course outcome specified as per Bloom’s Taxonomy)

SECTION B (5 mark)

UNIT - I

1. What is the principle behind pH meter?
2. What is buffer solution?
3. What cell organelle can be viewed under a light microscope?
4. What are the advantages and disadvantages of electron microscope?
5. Give account on SEM imaging?
6. What is centrifugation technique?
7. What is the purpose of centrifugation?
8. What are the uses of centrifugation?
9. What is ultracentrifugation technique?
10. How does a TEM microscope work?

UNIT – II

11. What is the equation for the Beer Lambert law?
12. How do you calculate absorbance in Beer's law?
13. Why absorbance increases with concentration?
14. What is the difference between a spectrometer and a spectrophotometer?
15. How does the UV VIS spectroscopy works?
16. What is the difference between colorimeter and spectrophotometer?
17. What is the basic principle of UV Visible Spectroscopy?
18. What is the basic principle of FTIR Spectroscopy?
19. What is the basic principle of mass Spectroscopy?
20. What is the basic principle of flame photometer?

UNIT – III

21. What is the main purpose of chromatography?
22. How does paper chromatography work?
23. What are the four types of chromatography?
24. What does thin layer chromatography tell you?
25. What is chromatography and how does it work?

26. What does an RF value mean?
27. What are the four types of chromatography?
28. What are the limitations of thin layer chromatography?
29. What is the principle of HPLC?
30. What is the basic principle of gas chromatography?

UNIT – IV

31. What do you understand electrophoresis?
32. What is the basic principle of electrophoresis?
33. What is the procedure of electrophoresis?
34. How do you prepare a DNA sample for electrophoresis?
35. What is the function of the loading dye in electrophoresis?
36. What is the principle of agarose gel electrophoresis?
37. How does SDS gel electrophoresis work?
38. Why is SDS PAGE used for proteins?
39. Why is beta mercaptoethanol used in SDS PAGE?
40. How does the polymerase chain reaction work?

UNIT – V

41. Write note on Primary treatment
42. Write note on Secondary treatment
43. Write note on Tertiary treatment
44. Write a note on risk involved in usage of GMO in Bioremediation
45. Give an account on oxidation pond
46. Give an account on the novel method for pollution control
47. Give an account on Trickling filter with a neat diagram
48. Write a note on biology of trickling filter
49. Give an account on anaerobic digester
50. Write the detailed note on vermicomposting

SECTION - C (8 Mark)

UNIT - I

1. What is a pH meter and what is it used for?
2. What is the principle of pH meter on PDF?
3. What happens when a strong acid is added to a buffer?
4. What is SEM and how it works?
5. Can you explain what SEM enables you to do?
6. What are some useful applications of a dissecting microscope?
7. Why are different speeds of centrifugation used?
8. What is the principle of centrifugation technique?
9. What is the application of centrifugation?
10. Give details note on ultracentrifugation.

UNIT - II

11. What is the Beer Lambert law used for?
12. What is the principle of UV-Visible Spectrophotometer?
13. What are the components of a spectrophotometer?
14. What is a UV-VIS spectrophotometer used for?
15. What is the function of a spectrophotometer?
16. What is IR spectroscopy principle?
17. How does frequency relate to wavelength?
18. What is a mass spectrophotometer and what does it work?
19. What is a flame photometer and what does it work?
20. How does a Geiger Muller counter work?

UNIT - III

21. What is the basis (principle) of chromatographic process?
22. What are the moving and stationary phases in paper chromatography?
23. What are the type of chromatography in protein separation?
24. In which type of chromatography the stationary phase held in a narrow tube and the mobile phase is forced through it under pressure?
25. What type of solvents are generally employed in column chromatography? Explain with suitable diagram.
26. What is the main purpose of the mobile phase in chromatography?
27. What is the mobile and stationary phase in column chromatography?

28. Give detailed note on HPLC in identification of phytochemical percentage in plant extract.
29. Give detailed note on affinity chromatography.
30. How does size exclusion chromatography work?

UNIT - IV

31. What is electrophoresis and its types and applications?
32. What is the purpose of electrophoresis and what does it do?
33. How does gel electrophoresis identify proteins?
34. How does SDS PAGE work? Give detailed note on Application of SDS PAGE?
35. What are the types of electrophoresis?
36. What physical property determines how the DNA moves the gel?
37. What are the three main steps in the PCR process?
38. How does ELISA help in detection of disease?
39. Why is the sequence of nucleotides so important? Explain with suitable diagram.
40. What is the difference between direct and indirect Elisa? Explain with suitable diagrammatic reactions.

UNIT - V

41. Give an account on bioreactors used for aerobic biological treatment
42. Give an account on bioreactors used for anaerobic biological treatments
43. With a neat diagram explain different types of UASB
44. Give the usage of genetically engineered organism in waste water treatment
45. Explain the recycling of organic wastes through earthworm cultivation
46. Give the physico chemical characteristic of drinking water
47. Give a note on activated sludge process with the type of modification (aeration)
48. Give an account on various system of advanced activated sludge processes developed till date.
49. Give the Primary secondary and advance treatment method for the removal of Phosphorus
50. Give the microbial method to test the quality of drinking water.

KONGUNADU ARTS AND SCIENCE COLLEGE
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QUESTION BANK

SUBJECT CODE: **18PBT103**

TITLE OF THE PAPER: **CELL BIOLOGY AND MOLECULAR GENETICS**

COMPILED BY

Dr. R. AMSAVENI

Assistant Professor

PG AND RESEARCH DEPARTMENT OF BIOTECHNOLOGY

December 2018

Core paper-3 CELL BIOLOGY AND MOLECULAR GENETICS

One mark questions

UNIT-I

- Diffusion involves movement of _____ entering or leaving the cell.
(a) Water (b) **molecules** (c) high concentrated solvent (d) low concentrated molecules
- Concentration gradient trying to even out concentration is
(a) Equilibrium (b) **driving force** (c) active transport (d) passive transport
- Glucose transporter is an example of
(a) Active transport (b) diffusion (c) **facilitated diffusion** (d) passive transport
- In sodium potassium pump by pumping against the gradient the cell builds even bigger gradient that helps in
(a) Apoptosis (b) metabolism (c) **nerve impulse** (d) transport of molecules
- Neurotransmitters are a class of _____ molecules that travel across the tiny space between adjacent neurons.
(a) Long range receptor (b) short range receptor (c) long range signaling (d) **short range signaling**
- Paracrine signaling is stimulated by
(a) Neurotransmitters (b) cell surface receptor (c) **cytokines** (d) acetylcholine
- Anklesaria *et al* described that a possible way of signal transduction between TGF alpha and EGFR
(a) Paracrine signaling (b) endocrine signaling (c) GPCR signaling (d) **juxtacrine signaling**
- Cells expressing the Delta, Jagged proteins in their cell membranes activate neighboring cells that contain the _____ protein in their cell membrane.
(a) Serrate (b) GPCR (c) TGF-beta (d) **notch**
- Pineal gland produce _____ hormone.
(a) **Melatonin** (b) erythropoietin (c) T3 &T4 (d) acetylcholine

10. A collection of neurons in the hypothalamus of the brain is called as

- (a) Pituitary gland (b) adrenal gland (c) **arcuate nucleus** (d) pineal gland

11. Pituitary gland secretes _____ hormones that regulate homeostasis and secretion of other hormones.

- (a) 15 (b) 11 (c) 5 (d) **9**

12. Schizophrenia is a

- (a) Inherited disorder (b) autosomal inheritance
(c) **neurotransmitter disorder** (d) allosomal disorder

13. In GPCR the intracellular domain is coupled to a

- (a) Heterodimeric G-protein (b) **heterotrimeric G-protein**
(c) homodimeric G-protein (d) 7 transmembrane

14. Calmodulin is a

- (a) Ubiquitous, mediates nerve growth, muscle contraction
(b) mediates apoptosis, inflammation, immune response
(c) mediates apoptosis (d) **all the above**

15. In cell division amplification cascade the receptor responds to growth promoting signal by phosphorylating an intracellular protein called

- (a) cGMP (b) kinase (c) GPCR (d) **ras**

16. First discovered protein in the cancer cells is

- (a) Apoptotic signal (b) acetylcholine (c) **ras** (d) signaling molecule

17. Notch receptor is a _____ receptor protein

- (a) Single-pass membrane (b) double-pass membrane
(c) **single-pass transmembrane** (d) double-pass transmembrane

18. Notch signaling promotes proliferative signaling during

- (a) Cell division (b) apoptosis (c) cancer growth (d) **neurogenesis**

19. TGF-beta ligand binds to either Type-I or Type-II receptors, to create _____ complexes.

(a) Heterotetrameric (b) homodimeric (c) **heterodimeric** (d) homotrimeric

20. In Jak-STAT pathway the phosphorylating is done by

(a) cGMP (b) cAMP (c) protein kinase (d) **tyrosine kinase**

UNIT -II

21. A tight seal between adjacent cells

(a) Gap junctions (b) **tight junctions** (c) anchoring junctions (d) desmosomes

22. The cell adhesion molecules are linked to actin microfilaments by linking proteins such as catenin.

(a) **Adherens junctions** (b) desmosomes (c) tight junctions (d) gap junction

23. The cell adhesion molecules are linked to intermediate filaments.

(a) Adhesion junctions (b) **desmosomes** (c) tight junctions (d) gap junction

24. The type of programmed cell-death requiring caspase activity and in which the dying cell shows highly conserved morphological changes, including chromatin compaction, membrane blebbing and cell shrinkage.

(a) **Apoptosis** (b) autophagy (c) caspase activator (d) necrosis

25. A type of cell death that is not programmed during development or hemostasis but results from physical trauma.

(a) Apoptosis (b) **necrosis** (c) phagocytosis (d) autophagy

26. The process through which a dying cell is engulfed by a healthy cell.

(a) Autophagy (b) **phagocytosis** (c) autophagy (d) apoptosis

27. Initiator caspases involved in apoptosis

(a) **Caspase 2,8,9,10** (b) caspase 3,6,7 (c) caspase 1,4,5 (d) none of these

28. Effector caspases involved in apoptosis

(a) Caspase 2,8,9,10 (b) **caspase 3,6,7** (c) caspase 1,4,5 (d) none of these

29. Caspase activity involved in extrinsic pathway is
(a) **Caspase 8** (b) caspase 9 (c) caspase 5 (d) caspase 1
30. Caspase activity involved in intrinsic pathway is
(a) **Caspase 9** (b) caspase 8 (c) caspase 5 (d) caspase 1
31. What makes a cell decide to commit suicide?
(a) Tumor necrosis factor alpha (b) fas ligand (c) **both a and b** (d) fas receptor
32. The intrinsic pathway are otherwise called as
(a) Death receptor pathway (b) **mitochondrial pathway**
(c) none of these (d) both a and b
33. In which phase of cell cycle, the Cell grows and prepares to synthesize DNA
(a) **G1 or gap phase** (b) s or synthesis phase (c) g2 or second gap (d) m phase
34. In which phase of cell cycle, the cell prepares to divide
(a) G1 or gap phase (b) s or synthesis phase (c) **g2 or second gap** (d) m phase
35. Enzymes that modify various protein substrates involved in cell cycle progression is
(a) Cyclin (b) **cyclin-dependent kinases** (c) phosphatase (d) none of these
36. The protein that have no enzymatic activity of their own but activate CDKs by binding to them
(a) Phosphatase (b) cyclin-dependent kinases (c) **cyclin** (d) none of these
37. Which checkpoint determines whether all the sister chromatids are correctly attached to the spindle microtubules before the cell enters the irreversible anaphase stage.
(a) G1 checkpoint (b) g2 checkpoint (c) **m checkpoint** (d) s check point
38. Which checkpoint ensures all of the chromosomes have been replicated and the replicated DNA is not damaged before cell enters mitosis
(a) G1 checkpoint (b) **g2 checkpoint** (c) m checkpoint (d) s check point
39. At which checkpoint, DNA Damage and other external factors are evaluated

(a) **G1 checkpoint** (b) g2 checkpoint (c) m checkpoint (d) s checkpoint

40. Which organism has developed as a model organism.

(a) *S. cerevisiae* (b) *staphylococcus* (c) *streptococcus* (d) none of these

UNIT-III

41. Chromosome replication in bacteria is regulated at the _____ stage.

a) **Initiation** b) termination c) elongation d) none of these

42. _____ is loaded into the DNA and replication begins.

a) helicase b) lipase c) **DNA polymerase** d) exokinase

43. The RNA primers of _____ are subsequently degraded by RNase H and DNA Polymerase I

a) **Okazaki fragments** b) DNA ligase c) DNA replication d) topoisomerase

44. _____ in *E. coli* unlinks or decatenates the two circular DNA duplexes.

(a) DNA ligase (b) polymerase (c) **topoisomerase2** (d) template

45. A dynamic complex of RNA and protein subunits that removes introns from precursor mRNA is called _____.

(a) DNA helicase (b) RNase (c) **spliceosome** (d) mRNA

46. Eukaryotic genes are composed of _____ which correspond to protein-coding sequences.

(a) Introns (b) promoter (c) **exons** (d) response elements

47. The process of removing introns and reconnecting exons is called _____.

(a) **Splicing** (b) topoisomerase (c) RNA polymerase (d) protease

48. Each spliceosome is composed of five subunits called _____.

(a) RNase (b) **snRNP** (c) dnase (d) mRNA

49. Post-translational modifications can occur on the _____.

(a) Peptide chain (b) polypeptide chain (c) **amino acid side chain** (d) none of these

50. Proteins are synthesized _____.

- (a) Ribosome translating rRNA (b) **ribosome translating mRNA**
(c) spliciosome (d) proteolysis

51. DNA replication is initiated from specific sequences called _____.

- (a) **Origin of replication** (b) spliceosomes (c) promoters (d) silencer

52. _____ is the chemical modification of protein

- (a) **Post translational modification** (b) DNA replication
(c) protein folding (d) post transcriptional modification

53. Post translational modification can be detected by _____.

- (a) MS technique (b) gel based detection (c) **both a and b** (d) none of the

54. Post translational modification includes _____.

- (a) Peptide bonds (b) amino acids (c) **all the above** (d) disulphide bond

55. _____ adds lysine residue of a target protein marketing it for destruction.

- (a) **Ubiquitin** (b) acetylation (c) glycosylation (d) phosporylation

56. _____ is an enzyme responsible for N-terminal acetylation.

- (a) **Methionine amino peptidase** (b) amino group (c) carboxylase (d) acetyl group

57. Post translational modification mostly occurs in _____.

- (a) Golgi apparatus (b) endoplasmic reticulum (c) **both a and b** (d) ribosome

58. The rho protein bind the _____.

- (a) Single stranded DNA (b) **single stranded RNA** (c) double stranded DNA
(d) double stranded RNA

59. The base pairing and chain formation reactions, which form the daughter helix, are catalyzed by DNA polymerases .

- (a) **DNA polymerase** (b) DNA helicase (c) RNase (d) peptidase

60. Cdc45 associates with chromatin after the beginning of initiation in late G₁ stage.

- (a) Cdc7 (b) **Cdc45** (c) Cdk (d) Cdc25

UNIT-IV

61. Allergy to penicillin is an example of

- a) **Type I hypersensitivity** b) Type II hypersensitivity
c) Type III hypersensitivity d) Type IV hypersensitivity

62. Type IV hypersensitivity is also called as

- a) Immediate hypersensitivity b) **delayed hypersensitivity**
c) cytotoxic hypersensitivity d) immune complex hypersensitivity

63. The most common class of antibody involved in type II hypersensitivity is

- a) **IgG** b) IgM c) IgE d) IgD

64 T helper cell mediated hypersensitivity is

- a) Type I hypersensitivity b) Type II hypersensitivity
c) Type III hypersensitivity d) **Type IV hypersensitivity**

65. Type III hypersensitivity is triggered by

- a) Mast cells and IgE b) K cells and IgG
c) **deposition of antigen antibody complexes** d) Th cells

66. Autoimmune hemolytic anemia (AHA) is an example of

- a) Type I hypersensitivity b) **Type II hypersensitivity**
c) Type III hypersensitivity d) Type IV hypersensitivity

67. “Wheal and flare” reaction is characteristic reaction associated with identification of

- a) **Type I hypersensitivity** b) Type II hypersensitivity
c) Type III hypersensitivity d) Type IV hypersensitivity

68. K cells and IgG mediated hypersensitivity is

- a) Type I hypersensitivity
- b) **Type II hypersensitivity**
- c) Type III hypersensitivity
- d) Type IV hypersensitivity

69. Antibody dependant cytotoxicity is associated with

- a) Type I hypersensitivity
- b) **Type II hypersensitivity**
- c) Type III hypersensitivity
- d) Type IV hypersensitivity

70. Allergies to sea foods, eggs etc is an example of

- a) **Type I hypersensitivity**
- b) Type II hypersensitivity
- c) Type III hypersensitivity
- d) Type IV hypersensitivity

71. Which of the following is believed to be a key cause of immortalization of cancer cells in many tumours?

- a) Complete loss of telomeres
- b) Inactivation of the telomerase enzyme
- c) **Reactivation of the telomerase enzyme**
- d) Shortening of telomeres

72. Which of the following best defines an oncogene?

- a) An oncogene codes for a cell cycle control protein
- b) An oncogene codes for a mutated form of a protein that forms part of a signal transduction pathway
- c) An oncogene codes for a protein that prevents the cell from undergoing apoptosis
- d) **An oncogene is a dominantly expressed mutated gene that gives a cell a growth or survival advantage**

73. Which of the following types of protein could be coded by a tumour-suppressor gene?

- a) A protein that forms part of a growth factor signalling pathway
- b) A protein that codes for a DNA repair enzyme
- c) A protein that helps prevent apoptosis
- d) **A protein that controls progression through the cell cycle**

74. In what way does the ras oncogene contribute to cancers?

- a) Ras codes for an anti-apoptotic protein, which is produced in abnormally large amounts
- b) **Ras codes for a GTPase switch protein, which in its mutated form cannot be switched off**
- c) Ras codes for a transcription factor, which is produced in abnormally large amounts
- d) Ras codes for a truncated form of a growth factor receptor, which is continually active

75. Which property of p53 enables it to prevent the development of cancer

a) p53 is a transcription factor that causes production of proteins that stimulate the cell cycle b) **p53 prevents the replication of cells with damaged DNA** c) p53 prevents cells from triggering apoptosis d) p53 stimulates synthesis of DNA repair enzymes that replace telomere sequence lost during cell division.

76. Which of the following statements about the Rb tumour suppressor protein is correct?

a) Rb is activated when phosphorylated by Cdk b) **Rb binds the transcription factor E2F and thus prevents the cell from entering S phase until a mitogenic signal is received** c) Rb is a transcription factor d) When a mitogenic signal is received, Rb binds the transcription factor E2F and thus stimulates the cell to enter S phase

77. Which of the following is a characteristic of a cancer cell? Please select all that apply

a) Replicates an unlimited number of times b) Grows and divides without stimulation by a growth factor c) DNA damage does not halt cell division or stimulate apoptosis d) **All of these**

78. Which of the following is characteristic of a malignant rather than a benign tumour?

a) **Undergoes metastasis** b) Develops a blood supply c) Cells divide an unlimited number of times d) Grows without needing a growth signal

79. Which of the following types of mutation cannot give rise to an oncogene?

a) **Addition or deletion of a base producing a nonsense message and an inactive protein product** b) A point mutation changing just one amino acid in the protein product c) A translocation which puts the gene under the control of a strong promoter, producing over-expression d) A point mutation which produces a stop codon, prematurely terminating the message and producing a truncated protein

80. Which of the following can cause mutations which contribute to development of cancers? Please select all that apply

a) Chemicals in food b) UV and ionising radiation c) Reactive oxygen species d) **All the these**

UNIT-V

81. The involvement of genes in choosing environments that support personal behaviors and interests are referred to as:

a. Evocative b. **active** c. Passive d. the first and second choices

82. An example of a "polygenic origin" disorder, meaning that it runs in families but is not caused by genes at a single chromosomal location is:

- a. Mental Illnesses b. muscular Dystrophy c. **huntington's Chorea** d. the first and second choices

83. Parents are upset at the physical appearance of their child who is born with a small head, widely spaced eyes, and a flat nose that does not resemble the mother or father. Their child's appearance is a result of:

- a. Genotype-Environment Interaction (GEI) b. human Genome Project (HGP) c. huntington's Chorea (HC) d. **fetal Alcohol Syndrome (FAS)**

84. Which period of the nine-month gestational period is classified by commencing development of the fetus' organ systems and structures?

- a. The period of the fetus b. the period of the placenta c. the period of the ovum d. **the period of the embryo**

85. As discussed in the text, the following are all stages that the body goes through when handling stressors, EXCEPT:

- a. **Manic phase** b. resistance phase c. alarm phase d. exhaustion phase

86. Methodological criticism of the behavior genetics approach includes:

- a. It is based on the assumption that phenotype is the sum of genetic and environmental influences b. the data samples used in studies have been inadequate c. the interpretation of findings from twin studies is controversial d. **the first and third choices**

87. The textbook talks about the different conditions that influence the negative effect of teratogens on pregnancy. Which of the following statements is NOT a correct principle influencing the impact?

- a. The kind of damage done is the same irrespective of the stage of pregnancy b. **the adverse outcome depends on the dosage amount** c. the negative effect of teratogens is amplified if the fetus is exposed to more than one risk factor d. not all developing organism will be susceptible to teratogenic effect

88. What does the text describe as the body's building blocks?

- a. Enzymes b. neurons c. cells d. **proteins**

89. Which of the following is NOT a disorder of polygenic origin?

- a. **Huntington's chorea** b. alzheimer's disease c. multiple sclerosis d. clubfoot

90. What is the division of a normal body cell called?

- a. Meiosis b. **mitosis** c. replication d. doubling

91. Androgens are:

- a. Teratogens that cause low birth weight and prematurity b. released from the pituitary gland when the hypothalamus communicates danger c. single strands of DNA d. **necessary hormones in the development of male characteristics**

92. A baby was born with Down's syndrome. As an infant, she was needy and required constant attention from her parents. Her parents therefore became overprotective and "babied" her as a child, keeping her close at all times and doing many things for her even though she had the ability to do things herself. When she entered school, she was described as immature, clingy, and socially and cognitively delayed. This example illustrates which type of genetic influence on environment.

- a. Passive b. **evocative** c. active d. heritable

93. According to the text and the Surgeon General, how much alcohol would be considered appropriate for a mother during pregnancy?

- a. One glass of red wine in the evening b. a beer on the weekend at a friend's barbeque c. a shot of tequila at a bar d. **no safe dosage**

94. Which of the following factors does NOT contribute to the fact that male conceptions outnumber female conceptions 14 to 10 but male births only slightly outnumber female births?

- a. Female zygotes survive the prenatal period better than males b. males are more susceptible to some genetic disorders than females c. **the X chromosomes of all males zygotes have "fragile X syndrome"** d. the smaller Y chromosome does not carry all of the genes that the longer X chromosome carries

95. As children get older, they choose environments and companions that are compatible with their interests. This is an example of:

- a. Coaction b. **niche picking** c. evocative gene influences d. gene expression

96. Which of the following is NOT a requirement of populations in Hardy-Weinberg equilibrium?

- a. **Small population** b. panmixia c. no selection d. all of the above are requirements of Hardy-Weinberg Equilibrium

97. In the Hardy-Weinberg equation, $2pq$ represents:

- a. The frequency of homozygous dominant individuals in the population b. the frequency of homozygous recessive individuals in the population c. **the frequency of heterozygous individuals in the population** d. none of these

98. The number of hamsters it takes to screw in a lightbulb.

In the Hardy-Weinberg equation, _____ + _____ = 1

- a. Hamster + guinea pig b. $p^2 + q^2$ c. **$p+q$** d. $2p + 2q$

99. Long ears is a dominant trait in rabbits. In a population of 100 rabbits, 15 of them have short ears. What is q^2 for this population?

- a. 1.0 b. 0.85 c. 0.5 d. **0.15**

100. 500 frogs are in a pond. In these frogs, yellow skin spots are a dominant trait. There are 350 frogs with yellow skin spots. How many frogs are probably Aa ?

- a. 150 b. 252 c. **248** d. 350

Core paper-3 CELL BIOLOGY AND MOLECULAR GENETICS

FIVE MARK QUESTIONS

UNIT-1

1. Explain osmosis
2. Explain active transport with example
3. Explain juxtacrine signaling
4. Explain paracrine signaling with example
5. Explain endocrine signaling with example
6. Write a short note on signal transduction pathway
7. Write a short note on Notch signaling
8. Write a short note on TGF- β & activation of Smad
9. Brief note on Jak-STAT pathway
10. Write a note on Notch & Jak-STAT pathway

UNIT-2

11. Write about any 3 extracellular components
12. Explain about cell-cell interaction
13. Explain about cell-matrix interaction
14. Write about any 3 hormones
15. Write about the classes of growth factors
16. Explain the intrinsic pathway
17. Explain the extrinsic pathway
18. Write about the cell cycle control mechanism
19. Write a short note on role of cyclins & cdks
20. Write a short note on *saccharomyces cerevisiae*

UNIT-3

21. Explain the process involved in replication
22. Explain the process involved in RNA replication
23. Write about the enzymology of replication
24. Explain about the transcription process
25. Explain about the RNA processing
26. Explain about the translation process
27. Explain about the post translational modification process
28. Brief note on intracellular protein transport
29. Brief note on protein turn over
30. Brief note on degradation of protein

UNIT-4

31. Explain about the chromatin structure

32. Explain about the remodeling of chromatin
33. Explain about the DNase hypersensitivity
34. Explain about the DNA methylation
35. Explain about the process involved in the trp operon concept
36. Explain about the gene battery model
37. Brief note on process involved in lytic cascade repression in lambda
38. Brief note on process involved in lysogenic cascade repression in lambda
39. Brief note on cause & genetics of cancer
40. Brief note on tumor suppressor genes

UNIT-5

41. Brief note on inherited disorders
42. Write any 3 autosomal inherited disorders
43. Write any 3 allosomal inherited disorders
44. Explain about the molecular cytogenetics
45. Write any 3 teratological disorders
46. Write about the molecular screening of hematological malignancies & cancer
47. Explain about the phramacogenetics
48. Explain the Hardy-Weinberg principle & multifactorial interactions
49. Explain the causes of variations & artificial selection
50. Brief note on detection assays

Core paper-3 CELL BIOLOGY AND MOLECULAR GENETICS

EIGHT MARK QUESTIONS

UNIT-1

1. Explain about the cell transport mechanism
2. Explain about the passive transport with example
3. Explain & give a schematic representation of paracrine signaling pathways
4. Explain & give a schematic representation of juxtacrine & endocrine signaling pathways
5. Brief note on GPCR with diagram
6. Explain & give a schematic representation of signaling pathway of GPCR
7. Brief note on cell signaling pathways that control the gene activity
8. Explain & give a schematic representation of Notch signaling with example
9. Explain & give a schematic representation of Jak-STAT pathway with example
10. Explain & give a schematic representation of TGF- β & activation of Smad with example

UNIT-2

11. Write about any 5 extracellular components
12. Explain & give a schematic representation of cell-cell interaction & cell-matrix interaction
13. Explain the cell differentiation with schematic representation & example
14. Write about any 5 hormones & classes of growth factors
15. Explain about the apoptotic pathways and its process
16. Explain & give a schematic representation of intrinsic pathway with example
17. Explain & give a schematic representation of extrinsic pathway with example
18. Explain about the cell cycle control mechanism & role of cyclins & cdks
19. Explain about the cell cycle checkpoints with diagram
20. Explain about the molecular events of *saccharomyces cerevisiae*

UNIT-3

21. Explain & give a schematic representation of DNA replication in prokaryotes
22. Explain & give a schematic representation of DNA replication in eukaryotes
23. Explain & give a schematic representation of RNA replication & enzymology
24. Explain & give a schematic representation of gene expression
25. Explain & give a schematic representation of transcription in eukaryotes
26. Explain & give a schematic representation of translation & enzymology of replication in eukaryotes
27. Explain & give a schematic representation of post translational modification in eukaryotes
28. Explain & give a schematic representation of translation & post translational modification in eukaryotes
29. Explain & give a schematic representation of intracellular protein transport
30. Explain & give a schematic representation of protein turnover & degradation

UNIT-4

31. Explain about the chromatin structure & remodeling with diagram
32. Explain about the DNase hypersensitivity & DNA methylation with example
33. Explain about the control of gene expression
34. Explain & give a schematic representation of trp operon concept
35. Explain & give a schematic representation of gene battery model
36. Explain & give a schematic representation of lytic & lysogenic repression in lambda
37. Explain & give a schematic representation of cause for lysogenic repression in lambda
38. Explain about the cancer, types, cause & genetics of cancer
39. Explain about the tumor suppressor gene p53 & pRB
40. Explain about the tumor suppressor gene p53 & activation of p53 gene & oncogenes

UNIT-5

41. Write about the inherited autosomal & allosomal disorder
42. Write any 5 autosomal inherited disorders
43. Write any 5 allosomal inherited disorders
44. Explain about the molecular cytogenetics & teratology
45. Write any 5 teratological disorders
46. Explain cancer & molecular screening of hematological malignancies
47. Explain pharmacogenetics with link to Her2 & Breast cancer
48. Explain about the population genetics & Hardy-Weinberg principle
49. Explain about the genetic load & genetic counseling
50. Explain about the genotoxicity and detection assays

KONGUNADU ARTS AND SCIENCE COLLEGE

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QUESTION BANK



I-M.Sc. Biotechnology (2018-2020 Batch)

SUBJECT CODE: 18PBT208

Paper title: ENVIRONMENTAL BIOTECHNOLOGY

PG AND RESEARCH DEPARTMENT OF BIOTECHNOLOGY

APRIL 2019

(Knowledge level K1 Remembering is followed in relation to course Outcomes specified as per Bloom's Taxonomy)

SECTION – A (1 Mark)

Choose the correct answer

UNIT-I

1. TOC is
 - a) **Total oxidation content**
 - b) Total organic carbon
 - c) Total oxygen and carbon
 - d) Toxicity of carbon
2. Macrophytes used in waste water treatment
 - a) Eicchornia sp
 - b) Spathyphyllum Sp
 - c) **Myriophyllum Sp**
 - d) Hydrilla Sp
3. Gases having obnoxious odor is/are
 - a) **H₂S and mercaptans**
 - b) Phenols
 - c) Hydrocarbons
 - d) all the above
4. The organism used to indicate fecal contamination is
 - a) E.coli
 - b) **Thiobacillus**
 - c) Streptobacillus
 - d) Salmonella
5. The organism involved in biogas production is
 - a) **Methanogens**
 - b) Methylotrophs
 - c) Clostridium
 - d) Bacillus
6. Chlorella pyrenoidosa is usually found in
 - a) Sludge digestion tank

- b) Trickling filter**
 - c) Oxidation pond
 - d) Activated sludge process
- 7. BOD can be measured during third and fifth date respectively at the temperature of
 - a) 20⁰ C and 27⁰C**
 - b) 25⁰ C and 27⁰C
 - c) 20⁰ C and 25⁰C
 - d) 27⁰ C and 37⁰C
- 8. MLSS is
 - a) Mixed liquor suspended solids**
 - b) Mixed liquor solid substrate
 - c) Minimum liquid of suspended solid
 - d) Mixed liquor solid salt
- 9. The depth of rock in the trickling filter varies from
 - a) 3-8 ft**
 - b) 8-10 ft
 - c) 2-10 ft
 - d) None of the above
- 10. PCR is
 - a) Polymerase chain reaction
 - b) Packed column reactor**
 - c) Packed cylinder reactor
 - d) Packed bed reactor
- 11. Sludge granulation is done in
 - a) Activated sludge process
 - b) UASB**
 - c) Trickling filter
 - d) Fluidised bed reactor
- 12. Which among the following is rich in ethanol yields
 - a) Corn**
 - b) Molasses

- c) Wood
- d) Sweet sorghum

13. Chlorination is

- a) Primary treatment**
- b) Secondary treatment
- c) Pretreatment
- d) Advanced method

14. Biogas is

- a) CCl_4
- b) CH_4**
- c) H_2S
- d) $\text{CH}_2 = \text{CH}_2$

15. Pick out the odd match

- a) Solid state fermentation _Mushroom
- b) Earthworm – Vermiculture
- c) Saline soil – gypsum application**
- d) Landfill – Solid waste disposal

16. Identify the irrelevant match

- a. Effluent treatment – Trickling filter
- b. Sewage water treatment – Oxidation Pond
- c. Saline soils – Carbonates and Bicarbonates**
- d. Alkaline soils – Chloride and Sulphate ions

17. Sludge and slurry is a

- a) Solid waste
- b) Liquid waste
- c) Solid and liquid waste**
- d) Liquid and solid waste

18. Eutrophication is due to

- a) Organic waste**
- b) Inorganic wastes
- c) Algal blooms
- d) Microbes

19. Nitrification, Denitrification, Phosphorus accumulation ligninases activity occurs in

- a) Aerobic
- b) Anaerobic
- c) Both**
- d) Special designer

20. The byproduct which is obtained from aerobic process is

- a) CO₂**
- b) Alcohol
- c) Methane
- d) Organic acids

UNIT - II

21. COD involves the oxidation of organics using

- a) Potassium dichromate**
- b) Sulphuric acid
- c) Silver sulphate
- d) All the above

22. The BIS limit for lead in wastewater is

- a) 0.1 mg/L**
- b) 1 mg/L
- c) 12 mg/L
- d) 0.001 mg/L

23. The BIS for E.coli is

- a) 1/100 ml**
- b) 10/100 ml
- c) 2/100 ml
- d) None of the above

24. Red tide is caused due to

- a) Karenia brevis**
- b) Alexandrium fundyense
- c) All the above
- d) None of the above

25. Toxins released by shell fishes when present in red tide area is
- a) Gymnosin A
 - b) Saxitoxin**
 - c) Brevitoxin
 - d) All the above
26. Sloughing off is a major problem in
- a) Trickling filter
 - b) Biofilter
 - c) RBC
 - d) All the above**
27. The minimum threshold value of substrate concentration required for microbial population to remain alive is
- a) 0.1- 1 mg/L**
 - b) 1 –2 mg/L
 - c) 2-5 mg/L
 - d) None of the above
28. Trickling filter is an example of
- a) Suspended growth
 - b) Attached growth**
 - c) Both a and b
 - d) None of the above
29. The municipal waste and excreta are composted into
- a) Night soil compost**
 - b) Black compost
 - c) Litter compost
 - d) Vermin cast
30. The spent slurry of biogas digester is
- a) Made into compost or manure.**
 - b) Reusable for biogas production.
 - c) Used as a disinfectant.
 - d) Used as carrier in biofertilizer production.

31. Which among the following industrial effluent is most hazardous?
- a) **Tannery**
 - b) Textile
 - c) Sago
 - d) Sugar
32. Heavy metals is better trapped by the plant
- a) Eichhornia Sp
 - b) Potomegatton Sp
 - c) Acacia Sp
 - d) **All the above**
33. Minimata disease was due to
- a) **Accumulation of Hg**
 - b) Accumulation of Cu
 - c) Accumulation of Pb
 - d) None of the above
34. The main problem associated with solid waste management is
- a) **Seggregation**
 - b) Moisture content
 - c) Waste quantity
 - d) Heavy metals
35. Organism involved in metal corrosion is
- a) Pseudomonas
 - b) **Thiobacillus**
 - c) Clostridium
 - d) Bacillus
36. Itai Itai disease is caused due to
- a) **Cadmium**
 - b) Mercury
 - c) Copper
 - d) Uranium

37. Wilson's disease is mainly caused due to
- a) **Cadmium**
 - b) Mercury
 - c) Copper
 - d) Uranium
38. Skin brightening cream contains
- a) Cadmium
 - b) **Mercury**
 - c) Copper
 - d) Uranium
39. Biosorption is a/an
- a) **Active process**
 - b) Passive process
 - c) Both a and b
 - d) None
40. In which organism the accumulation of metals in mucilaginous layer occurs
- a) **Sphaerotilus natans**
 - b) P. fluorescens
 - c) Citrobacter
 - d) Bacillus Sp
 - e) Salmonella Sp

UNIT - III

41. Which among the following is bioremediation?
- a) Accumulation of toxins.
 - b) Elimination of toxins.
 - c) Toxins are converted to inactive forms
 - d) **None of the above**
42. Which of the following does not inhibit biodegradation much
- a) Heavy metals
 - b) Metals
 - c) **Surfactants**
 - d) Grease

43. Plasmids of which organism codes for enzymes for degradation
- a) **Pseudomonas Sp**
 - b) Leptothrix
 - c) Thiobacillus sp
 - d) Nitrosomonas sp
44. A recalcitrant compound is characterized by
- a) **Unusal bonding**
 - b) Unusual halogenation
 - c) Excessive toxicity
 - d) All the above
45. Aromatic xenobiotics can be detoxified by
- a) **Protozoans, nematodes and Rotifers only**
 - b) Bacteria and Fungi only
 - c) None of the above
 - d) All of the above
46. The compound which are not degraded in nature following their release into the environment even when conditions appear to be adequate for microbial growth
- a) **Recalcitrant**
 - b) Resistant
 - c) Competent
 - d) All the above
47. The three R principle in solid waste management is
- a) **Reduce, Reuse, recycle**
 - b) Refuse, Reuse, Replant
 - c) Recovery, reuse, Resource
 - d) None of the above
48. Which is the immobilized enzyme used for identifying the waste water containing pesticide
- a) **Parathion hydrolase**
 - b) Formamidase
 - c) Cyanade hydrate
 - d) Xylene
 - e) Ligninase

49. CAM Plasmid code for conversion of camphor to
- a) **Acetate +Butyrate**
 - b) Octanone
 - c) Benzoate
 - d) Pyruvate
50. OCT Plasmid code for conversion of octane to
- a) Acetate +Butyrate
 - b) **Octanone**
 - c) Benzoate
 - d) Pyruvate
51. NAH Plasmid code for conversion of naphthalene to
- a) **Acetate +Butyrate**
 - b) Octagon
 - c) Benzoate
 - d) Pyruvate +Acetaldehyde
52. SAL Plasmid code for conversion of salicylate to
- a) Acetate +Butyrate
 - b) Octanone
 - c) Benzoate
 - d) **Catechol**
53. Alcohol and fatty acids are converted to acetyl Co A by
- a) **Alpha oxidation**
 - b) Beta oxidation
 - c) Omega oxidation
 - d) None of the above
54. Degradative bacteria converts xenobiotics to
- a) Catechol
 - b) Protocatechuate
 - c) **Catechol/Protocatechuate**
 - d) None of the above

55. In degradation catechol is converted to
- a) **Acetyl coA**
 - b) Succinate
 - c) Acetyl CoA and succinate
 - d) None of the above
56. Rate of degradation of halogenated compound is
- a) **Directly related to number of halogen atoms**
 - b) Inversely related to number of halogen atoms
 - c) Directly related to atomic mass
 - d) None of the above
57. Superbug was created by
- a) **Chakrabathy**
 - b) Rosen
 - c) Chatterji
 - d) None of the above
58. pWWO plasmid degrades
- a) Xylene
 - b) Toluene
 - c) **Xylene and Toluene**
 - d) None of the above
59. PJP 2 Plasmid degrades
- a) DDT
 - b) DDE
 - c) **2, 4 D**
 - d) TCE
60. The toxic component of bacillus thuringensis is
- a) **Protein**
 - b) Whole cell
 - c) Spores
 - d) Polypeptide

UNIT - IV

61. pWVO is a

- a) **Megaplasmid**
- b) A very short DNA molecule
- c) Single stranded linear DNA
- d) Phagemid

62. Main waste from wire manufacturing industry is

- a) Hg and Cu
- b) **Ni and Cu**
- c) Hg and Ni
- d) Cu and Zn

63. Which of the following when grown on chrome waste can leach out chromium

- a) **Pseudomonas sp**
- b) Xanthomonas sp
- c) Brevibacterium sp
- d) Azotobacter Sp

64. The air borne disease caused due to textile industry waste is

- a) **Byssinosis**
- b) Emphysema
- c) Mottling of bones
- d) All the above

65. Biosorbent M is obtained from which organism

- a) **Pencillium chrysogenum**
- b) Zooglea ramiger
- c) Chlorella vulgaris
- d) Rhizopus arrhizus

66. What is the method used for softening of wood chips?

- a) **TMP**
- b) TCMTB
- c) FBR
- d) UASB

67. Kraft lignin is a waste from
- a) **Paper and pulp effluent**
 - b) Textile effluent
 - c) Spinning effluent
 - d) Electroplating effluent
68. Conversion of ammonia to nitrate is a
- a) Aerobic process
 - b) Anaerobic process
 - c) **Both a and b**
 - d) None
69. Organism used in deodorisation are
- a) **Streptomyces griseus**
 - b) Streptomyces antibioticus
 - c) Thermoactinomyces
 - d) All the above
70. Biopulping is done with
- a) **Lentinus edodes**
 - b) Trichoderma
 - c) Phaenerochaete
 - d) All the above
71. Lignin content of wood is lowered using
- a) **Lentinus edodes**
 - b) Trichoderma
 - c) Phaenerochaete
 - d) All the above
72. The bark used for tanning is
- a) Mimosa
 - b) Quebracho
 - c) **Mimosa and Quebracho**
 - d) Acacia

73. The nut used for tanning is
- a) **Chestnut**
 - b) Cashewnut
 - c) Beetlenut
 - d) None of the above
74. The dye used for leather processing is
- a) **Benzidine based dye**
 - b) Sulphate based dye
 - c) Bromine based dyes
 - d) All the above
75. The Curing agent used in tannery industry is
- a) **Sodium chloride**
 - b) Ammonium chloride
 - c) Sodium Nitrate
 - d) Sodium sulphate
76. Formamide can be converted to carbon dioxide using
- a) **Formamidase and Dehydrogenase**
 - b) Formamidase and Hydrogenase
 - c) Formamidase and Oxygenase
 - d) None of the above
77. Cyanide is used by the following industries
- a) **Electroplating**
 - b) Petroleum industry
 - c) Distillery industry
 - d) All the above
78. The enzyme responsible for hydrogen gas production is
- a) **Hydrogenase**
 - b) Dehydrogenase
 - c) Both a and b
 - d) None of the above

79. The ecofriendly option for unhairing in leather processing is the usage of

- a) **Proteolytic enzyme**
- b) Sodium sulphate
- c) Ammonium chloride
- d) None of the above

80. DOC is

- a) **Dissolved Organic carbon**
- b) Disaggregated organic carbon
- c) Department of conservation
- d) None of the above

UNIT - V

81. Protein produced from earth worm is

- a) **Vermitin**
- b) Peroxidase
- c) Cellulase
- d) Amylase

82. The ideal pH for vermicomposting is

- a) **6.5 –7.5**
- b) 7-8
- c) 4-5
- d) 5-6

83. The moisture content for vermicomposting is

- a) **60%**
- b) 50%
- c) 40%
- d) All the above

84. Which one of the following is a method of production of composting

- a) Denabandu model
- b) **Bangalore model**
- c) KVIC model
- d) TNAU model

85. Worm casts are used as
- a) **Bio fertilizer**
 - b) Biomanure
 - c) Package material
 - d) Enzyme source
86. Plastics can be biodegraded using
- a) Amylase
 - b) Peroxidase
 - c) **Lipase**
 - d) None of the above
87. CFCs are replaced by
- a) HCFC
 - b) HFCs
 - c) **Both a and b**
 - d) None of the above
88. A biodegradable protein bioflocculant (NOC-1) is produced from
- a) **Nocardia**
 - b) Rhodococcus
 - c) Galactouronic acid
 - d) None of the above
89. The activity of bioflocculant can be destroyed by
- a) Pepsin
 - b) Pronase-E
 - c) **Both a and b**
 - d) None of the above
90. Extraction of PHB is done using _____
- a) **Halogenated hydrocarbon**
 - b) Aldehyde
 - c) Lipids
 - d) None of the above

91. SSF is

- a) **Simultaneous Saccharification and Fermentation**
- b) Separate Saccharification and fermentation
- c) Simultaneous Simulation and Fermentatio
- d) None of the above

92. An example of Nitrogen fixing free living bacteria is

- a) **Beijerinckia**
- b) Azotobacter
- c) Acetobacter
- d) Azospirillum

93. Which among the following is not a feature of compost?

- a) Humus rich.
- b) Narrowed C: N ratio
- c) Organic nutrient rich.
- d) **Chemical fertilizer.**

94. The process of conversion of atmospheric nitrogen into ammonia is called

- a) **Biological nitrogen fixation**
- b) Nitrification
- c) Ammonification
- d) Denitrification

95. Which among the following is not a single cell protein?

- a) **Candida**
- b) Pleurotus
- c) Spirulina
- d) Volvariella

96. Which among the following organism is an SCP?

- a) **Spirulina**
- b) Candida
- c) Pseudomonas
- d) Agave

97. SCP produced from methanol is called

- a) **Pruteen**
- b) Biolac
- c) Biopol
- d) Bioceta

98. Brady rhizobium is

- a) **Fast growing**
- b) Symbiotic with soyabean
- c) Efficient than Rhizobium
- d) All the above

99. Which of the following microbe is widely used in the removal of industrial waste

- a) *Trichoderma sp*
- b) ***Aspergillus niger***
- c) *Pseudomonas putida*
- d) All of these

100. Which one the following material most commonly used for photocatalytic and sensing purpose

- a) Ag and Au
- b) CuO and ZnO
- c) **TiO₂ and ZnO**
- d) FeO and FNPs

(Knowledge levels K2 –Understanding, K3 –Applying, K4 Analysing, and K5-Evaluating are followed in relation to Course outcome specified as per Bloom's Taxonomy)

SECTION B (5 mark)

UNIT - I

1. Write note on Primary treatment
2. Write note on Secondary treatment
3. Write note on Tertiary treatment
4. Give the mechanism of phosphorus removal by Phostrip process
5. Give an account on Oxidation pond
6. Give an account on Oxidation Ditch
7. Give an account on Trickling filter with a neat diagram
8. Write a note on biology of trickling filter
9. Give an account on anaerobic digester
10. Write the biology of methane production

UNIT - II

11. Write a note on drinking water standards
12. Write note on primary sedimentation
13. Write note on electro dialysis for waste water treatment
14. Explain Reverse osmosis and its uses in dyeing industry
15. Write a note on immobilized enzymes used in waste water treatment
16. Give an account of impact of pollutants on biotreatment
17. Give note on Packaged microorganism
18. Give the advantages and Disadvantages in the usage of Genetically engineered microorganism in waste water treatment
19. Compare between aerobic and anaerobic treatment processes
20. Give a flow chart on different type of waste water treatment systems

UNIT - III

21. Give the role of algae in Biosorption
22. Define Biosorption and give the list of plants used in Biosorption process
23. Write a note on root zone treatment
24. What are novel methods of pollution control

25. Explain the microbial remediation of contaminated soil
26. Discuss on oil pollution and its impact on environment
27. What is the application of biotechnology in hazardous waste management
28. Write a note on risk involved in usage of GMO in Bioremediation
29. Give the ortho cleavage pathway of catechol and protochatechuate
30. Give the meta cleavage pathway of Catechol

UNIT - IV

31. Write note on Bioaugmentation
32. Give the bioremediation technique for oil spill treatment
33. Discuss about biological detoxification
34. Give the aerobic and anaerobic degradation of trichloro ethylene (TCE)
35. Give the constrains and priorities on bioremediation processes
36. Give the degradative pathway of trinitrotoluene
37. Give the pathway for the metabolism of 2, 4 D
38. Define
 - a) Recalcitrant
 - b) Biotransformation
 - c) Bioaccumulation
 - d) Biodegradation
39. Write a note on pump and treat method
40. Detail heavy metal removal from industrial effluent

UNIT - V

41. Write a note on advantages of vermitechnology
42. What is environmental biotechnology and give its applications
43. Explain the recycling of organic wastes through earthworm cultivation
44. Write a note on uranium leaching
45. Write a note on copper leaching
46. Give the chemistry and biology of leaching
47. Discuss about biodegradable plastics
48. What is SCP? Give its significance
49. Give a note on Environmental protection agencies
50. What is Rio Summit and give its objectives

SECTION - C (8 Mark)

UNIT – I

1. Give an account on bioreactors used for aerobic biological treatment
2. Give an account on bioreactors used for anaerobic biological treatments
3. With a neat diagram explain different types of UASB
4. Give the usage of genetically engineered organism in waste water treatment
5. Give the Primary secondary and advance treatment method for the removal of nitrogen
6. Give the physico chemical characteristic of drinking water
7. Give a note on activated sludge process with the type of modification (aeration)
8. Give an account on various system of advanced activated sludge processes developed till date.
9. Give the Primary secondary and advance treatment method for the removal of Phosphorus
10. Give the microbial method to test the quality of drinking water

UNIT – II

11. Give an account on various system that uses immobilized cells for biomethanisation.
12. Write a note on
 - a) Primary sedimentation
 - b) Activated sludge
 - c) Chlorination
13. Write a note on steps in Environmental Impact assessment
14. Give an account on the various characteristics taken into account for EIA
15. Define a) Biomining b) Biosorption c) Bioremediation d) Biomagnification
16. Define Biosorption and give the organism and applications of it
17. Write a note on Biomonitoring and environmental pollutant markers
18. Give an account on the novel method for pollution control
19. Give the sources of heavy metals and the impact of heavy metals on human
20. Define bioremediation and explain its types

UNIT – III

21. Give an account on solid waste minimization technology
22. Give an account on air pollution abatement and odour control
23. Write a brief account on Bioleaching and its advantage over chemical leaching
24. Define xenobiotics. Give an account on biodegradation of xenobiotics
25. How is genetic manipulation done for the degradation of xenobiotics
26. Write a note on bioremediation with its type
27. Give an account on solid waste management
28. Explain about the sewage sludge disposal and utilization
29. Give the degradative pathway for hydrocarbons
30. Give the degradative pathway for pesticides.

UNIT – IV

31. Give an account on the strategy of pesticide degradation with suitable examples
32. Give an account on biogas production from industrial waste
33. Give the biotechnological approach for treatment of tannery effluent
34. Give the biotechnological approach for treatment of Food industry effluent
35. Give the biotechnological approach for treatment of Distillery effluent
36. Give the biotechnological approach for treatment of Paper industries effluent
37. Give the biotechnological approach for treatment of Dyeing effluent
38. Give an account on the environment friendly chemicals that can be used in tannery industry
39. Give an account on leather processing and pollution load in the tannery effluent
40. Discuss about wealth from waste

UNIT – V

41. Write note on Current Status of Biotechnology in Environment Protection, Future
42. Explain how genetically engineered organisms can be used for pollution abatement
43. Explain the usage of transgenic plants in the production of bioplastics
44. Give an account on waste water treatment using aquatic plants and root zone treatment
45. Give an account on energy production from wastes.
46. Write a detailed account on bioremediation.
47. Describe about the use of microorganisms in biomass production from waste.
48. Write a detailed account on single cell protein production and process.
49. Discuss about the applications of nano-biotechnology in wastewater treatment.
50. Write a detailed account on polymer nanocomposite in wastewater treatment.

KONGUNADU ARTS AND SCIENCE COLLEGE

(AUTONOMOUS)

College of Excellence

COIMBATORE – 641 029

PREPARED BY

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QUESTION BANK



I-M.Sc. Biotechnology (2018-2020 batch)

SUBJECT CODE: 18PBT205

PAPER TITLE: Genetic Engineering

PG AND RESEARCH DEPARTMENT OF BIOTECHNOLOGY

APRIL 2019

SECTION-A (1 mark)

(Knowledge level K1 Remembering is followed in relation to course Outcomes specified as per Bloom's Taxonomy)

UNIT-1

1. Introduction of foreign gene for improving trait is called
a) Tissue culture b) Vernalization c) **Genetic engineering** d) Eugeneics
2. Genetic engineering is used in
a) Gene therapy b) Vaccine production c) Obtaining transgenics d) **All the above**
3. The humulin was established in
a) 1985 b) **1978** c) 1982 d) 1990
4. Chimaera is otherwise called as
a) Vector b) **rDNA molecule** c) Molecular vehicle d) None of the above
5. Nuclease is otherwise called as
a) Molecular scissor b) Nucleodepolymerase c) Polynucleodase d) **All the above**
6. Bal31 is an example for
a) **Exonuclease** b) Endonuclease c) Ligase d) Polymerase
8. The host in which the parasite undergoes essential development
a) **Definitive host** b) Intermediate host c) Reservoir host d) Paratenic host
9. Which accidental host serves as a holding place for parasite
a) Definitive host b) Intermediate host c) Reservoir host d) **Paratenic host**
10. Exonuclease III has _____ activity
a) 3¹-5¹ exonuclease b) AP endonuclease c) RNAse H d) **All the above**
11. S1 nuclease was purified from
a) *E. coli* b) *A. niger* c) *S. aureus* d) *P. vulgaris*
12. DNase I needs _____ for its activity
a) **Cation** b) Cleavage site c) ATP d) Both b and c
13. Molecular glue is otherwise called as
a) Lipase b) **Ligase** c) Gyrase d) Helicase
14. DNase II was discovered in
a) Bacteria b) Cow pancreas c) **Mammalian cells** d) None of the above
15. Catalytic site for DNase II is

- a) **Histidine** b) Arginine c) Lysine d) Leucine
16. Single stranded unpaired extensions formed by restriction enzyme upon cleavage is called as
 a) Blunt ends b) Flush ends c) **Sticky ends** d) None of these
17. Pick up the endo RNAse
 a) **RNAse A** b) RNAse D c) RNAse T d) RNAse R
18. If linker is combined with specific property as selectable marker, it is called as
 a) **Cassette** b) Modified linker c) Adaptor d) Induced linker
19. The technique used to convert blunt end to sticy end is called
 a) Restriction mapping b) **Homopolymer tailing** c) Gene targeting d) Gene manipulation
20. The enzyme used for homopolymer tailing is
 a) Restriction endonuclease b) Alkaline phosphatase
 c) **Terminal deoxynucleotetyl transferase** d) Ligase.

UNIT-11

21. Expression vector differs from cloning vector in having
 a) Origin of replication b) Marker gene c) Unique restriction site d) **Control elements**
22. In pBR 322, pBR stands for
 a) Plasmid Bacterial Recombination b) Plasmid Bacterial Replication c) **Plasmid Bolivar and Rodriguez** d) Plasmid Baltimore and Rodriguez
23. Vectors designed to replicate in cells of two different species are called
 a) Cosmid b) Transfer vectors c) Phagemid d) **Shuttle vectors**
24. Autonomously replicating sequence (ARS) is a characteristic feature of
 a) Plasmid vectors b) Phage vectors c) *E. coli* vectors d) **Yeast vectors**
25. Select the wrong statement about plasmids?
 a) Extrachromosomal b) Closed and circular
 c) **Its replication depends on host** d) Double stranded
26. The first engineered plasmid vector is
 a) pBR322 b) PUC vectors c) **pSC101** d) PUC19
27. The most popular and widely used engineered plasmid vector
 a) **pBR 322** b) pUC vectors c) pSC101 d) pUC 19
28. Conjugative plasmids

- a) Exhibit antibiotic resistance b) Do not exhibit antibiotic resistance
c) **Carry transfer genes called the *tra* genes** d) Do not carry transfer genes
29. Cos site of the cosmids
a) Consists of 12 bases b) Helps whole genome in circularization and ligation
c) **Both a & b** d) Contains cleavage site
30. M13 is an example of
a) Filamentous phage b) Single stranded DNA c) **Both a and b** d) Plasmid
31. Single stranded vectors are useful
a) For sequencing of cloned DNA b) For oligonucleotide directed mutagenesis
c) For probe preparation d) **All the above**
32. Size of the DNA that can be packaged into a λ phage is
a) 50kb b) **35-53kb** c) 40-50kb d) Any size
33. Cosmid vectors are used for
a) Cloning small fragments of DNA b) **Cloning large fragments of DNA**
c) Cloning prokaryotic DNA only d) Cloning eukaryotic DNA only
34. Plasmids which are maintained as multiple copy number per cell are known as
a) Stringent plasmids b) **Relaxed plasmids** c) Cryptic plasmids d) None of the above
35. Cosmid lacks
a) **Genes coding for viral proteins** b) Origin of replication c) Marker genes d) Cleavage site
36. Phagemid consist of
a) Plasmid vector carrying λ phage's cos site b) **plasmid and M13 components**
c) Plasmid vector carrying origin of replication of λ phage only
d) Plasmid vector carrying origin of replication of plasmid only
37. Maximum size of foreign DNA can be inserted into insertion vector is
a) 35kb b) **18kb** c) 50kb d) 27kb
38. Cryptic plasmids
a) **Do not exhibit any phenotypic trait** b) Exhibit many phenotypic trait
c) Exhibit one phenotypic trait d) Exhibit antibiotic resistance
39. Replacement vectors are the examples of
a) Plasmid vector b) **Phage vector** c) Cosmid vector d) Phagemid vector
40. P1 cloning vector is the example of
a) Plasmid b) Cosmid c) **Bacteriophage** d) Phagemid

UNIT-111

41. In human insulin, disulfide bond is present in between _____ residues of two chains
a) **Cystine** b) Adenine c) Thymine d) Guanine
42. The protein responsible for the purification of insulin is
a) Permease b) **β -galactosidase** c) Amylase d) Glucosidase
43. Commercially important recombinant hepatitis B virus vaccine was produced by
a) *E. coli* b) Mammalian cells c) **Yeast** d) None of the above
44. Hepatitis B vaccine is come under
a) Attenuated recombinant vaccine b) DNA vaccine
c) Vector recombinant vaccine d) **Subunit recombinant vaccine**
45. Tiny fat bubbles used to deliver genes are
a) Electropores b) Phospholipids c) Cholesterols d) **Liposomes**
46. The ability of cells to take up DNA fragment from surrounding is called as
a) **Transformation** b) Transfection c) Conjugation d) Transduction
47. The injection of DNA into developing inflorescence using a hypodermic syringe is called
a) Microfection b) Microinjection c) **Macroinjection** d) Micromanipulator
48. The virus mediated gene transfer by genetically modified bacteriophage is called
a) Transformation b) Transfection c) Conjugation d) **Transduction**
49. Strong promoter found in pET expression vector is
a) **T7** b) T5 c) T9 d) T6
50. Pick up the mobile element
a) Integrase b) Integron c) **Gene cassette** d) Fusion protein
51. The first drug produced using RDNA technology
a) **Insulin** b) Streptokinase c) TPA d) EPO
52. There are some advantages of expressing protein as a fusion protein. It may enhance stability, Folding by
a) Solubility, phosphodiester bond formation b) Insolubility, phosphodiester bond formation
c) **Solubility, disulphide bond formation** d) Insolubility, disulphide bond formation
53. A short peptide region fused to a protein of interest is known as
a) **Tag** b) Oligonucleotide c) Fragment d) Dimer
54. The expression vector has

- a) **Yeast** b) Plants c) Human d) Drosophila

67. An operon is made up of

- a) Promoter b) Operator c) Structural genes d) **All the above**

68. Write down the name of scientist who has discovered the method of site directed mutagenesis?

- a) Bostein Shortle b) Craik c) Grait d) **Joller Smith**

69. Concept of operon was coined by

- a) Jacob b) Monod c) Bergstrom and Samuelsson d) **Jacob and Monod**

70. Fusion gene can occur as a

- a) **Hybrid gene** b) Oncogene c) Both a and b d) Non e of these

71. Fusion gene can occurs as

- a) Translocation b) Insertion deletion c) Chromosomal inversion d) **All the above**

72. Phage is used in oligonucleotide directed mutagenesis

- a) **M13** b) Cosmid c) Phagemid d) Phage

73. The process of RNA inactivation by siRNA is termed as

- a) RNA silencing b) **RNA interference**
c) Short RNA inactivation d) Long interspersed RNA

74. HART stands for

- a) **Hybrid arrest translation** b) Hybrid accept translation
c) Hybrid activate translation d) Hybrid adjust translation

75. Which is used to identify the translation product encoded by a cloned gene.

- a) SiRNA b) MiRNA c) **HRT** d) tRNA

76. Down regulation of expression of endogenous genes by transformation with constructs that would generate sense RNA, rather than anti-sense RNA is known as:

- a) Suppression b) **Co-suppression** c) Multisuppression d) Anti-suppression

77. The method of post transcriptional gene silencing is particularly useful in:

- a) **Plants** b) Animals c) Insects d) Microorganisms

78. Introduction into host organism can also be done by using a DNA construct, which when transcribed, generates a RNA which is

- a) Circular b) Linear c) Double stranded d) **Self-complementary**

79. The word transposable element was coined by

- a) **Barbara Mc Clintock**
- b) R. W. Hedges
- c) Alexander Brink
- d) Peter Starlinger

80. material recovered directly from environmental samples

- a) Metagenomics
- b) Ecogenomics
- c) Environmental genomics
- d) **All the above**

UNIT-V

81. The short gun method

- a) is used in sequencing of genomes requires computers
- b) **is more accurate than the clone contig method**
- c) is normally used with large genomes
- d) takes more time than other genome sequencing approaches

82. Libraries can broadly be classified into how many types

- a) 1
- b) **2**
- c) 3
- d) 4

83. The various steps for construction of libraries are

(1) fragmentation of DNA (2) isolation of genomic DNA (3) amplification (4) ligation and introduction to the host (5) vector preparation

The correct order of construction of libraries is(in the order of starting to ending)

- a) 1>2>3>4>5
- b) **2>1>5>4>3**
- c) 2>5>1>4>3
- d) 5>2>1>3>4

84. Libraries using phage cloning vectors are often kept as

- a) Unpackaged phage
- b) **Packaged phage**
- c) Both packaged and unpackaged phage
- d) Both a and b are used but packaged is favoured.

85. The PCR variant designed for the study of RNA expression level is

- a) **RT PCR**
- b) qPCR
- c) Anchored PCR
- d) Traditional PCR

86. Probe is a

- a) protein for detecting a specific DNA molecule
- b) short piece of labeled DNA which are complementary to the nucleic acid strand to be detected
- c) **short piece of labeled DNA or RNA which are complementary to the nucleic acid strand to be detected**
- d) none of these

87. Aminobenzyloxymethyl filter paper is commonly used for transfer in

- a) Western blotting
- b) **Southern blotting**
- c) Northern blotting
- d) Dot blotting

88. The process of finding a particular member of library which is having some defined properties is called as

- a) Searching b) **Screening** c) Locating d) Narrowing
89. The technique used to identify specific DNA sequence in bacterial colonies is
 a) **Colony hybridization** b) In situ hybridization c) Dot blot technique d) Western blotting
90. The technique used to detect the presence of DNA or RNA in a non-fractionated DNA sample is
 a) Colony hybridization b) In situ hybridization c) **Dot blot technique** d) Western blotting
91. In northern hybridization probe hybridization forms
 a) DNA:RNA hybrid b) RNA:DNA hybrid c) **Both a and b** d) None of these
92. For protein detection the most commonly used probe is
 a) **Antibody** b) Lectin c) Antigen d) Interferon
93. The technique used to locate specific genes in a chromosome is called
 a) Colony hybridization b) **In situ hybridization** c) Dot blot technique d) Western blotting
94. What does the acronym PCR stand for
 a) **Polymerase chain reaction** b) Polymerase copying reaction
 c) Polymerase copied repeats d) Polymerase chain restoration
95. Which of the following serves as the first primer in RT-PCR for eukaryotic RNA
 a) Oligo dA b) **Oligo dT** c) Oligo dG d) Oligo dC
96. In RT-PCR the enzyme deoxynucleotide transferase adds poly-G residues in the
 a) 5`end of RNA b) 3`end of RNA c) **3`end of cDNA** d) 5`end of cDNA
97. Real time PCR also called as
 a) RT-PCR b) **qPCR** c) Ligase PCR d) Differential PCR
98. Genomic library is normally made by
 a) α phage vectors b) **λ phage vectors** c) β phage vectors d) γ phage vectors
99. Long probes are usually made by
 a) gene expression b) **cloning** c) hybridization d) PCR
100. Probe is used for
 a) Hybridisation with similar DNA b) **Hybridisation with complementary DNA**
 c) RACE d) Sequence data is not available in any case

SECTION-B (5 marks)

(Knowledge levels K2 –Understanding, K3 –Applying, K4 Analysing, and K5- Evaluating are followed in relation to Course outcome specified as per Bloom’s Taxonomy)

UNIT -I

1. Write an essay on genetic engineering.
2. Explain briefly about gene cloning.
3. Write a short note on application of genetic engineering.
4. Give short notes about hosts.
5. Enumerate the properties of ligases. Also, explain the mechanism of ligation.
6. What is restriction mapping?
7. Write a short note on homopolymer tailing.
8. Explain shortly about applications of restriction enzymes.
9. Explain a) linkers and b) adopters
10. Discuss about DNA polymerase in detail.

UNIT-II

1. Write short note on cloning vectors and explain any one of the cloning vectors.
2. Give short notes on plasmid and explain about the PBR322.
3. Draw a construct of plasmid PBR322.
4. Give a neat sketch of plasmid pUC18 vector.
5. Write a short notes about M13 vectors.
6. Explain shortly about phagemids.
7. Write short note about pJB8.
8. What is YAC?
9. Give short note on BAC.
10. Discuss about shuttle vectors.

UNIT-III

1. Write about recombinant proteins.
2. Write short note on hepatitis.
3. Explain about the transformation of biological methods.
4. Write shortly about expression vectors.

5. Explain about the physical and chemical gene transfer method.
6. Write short notes on promoters used in expression systems.
7. Give short notes on gene cassettes.
8. Discuss about gene fusion.
9. List out the advantages of fusion protein.
10. Explain shortly about DNA analysis in medicine.

UNIT-1V

1. Give short note on *in vitro* transcription.
2. Write about *in vitro* translation
3. Write short notes on HRT selection.
4. Explain about HART selection.
5. Give short notes on transposons.
6. Write shortly about mechanism of transposons.
7. Write short notes on operon concept.
8. Give a short account on siRNA.
9. What is miRNA?
10. Explain about metagenomic library.

UNIT-V

1. Write short notes on shot gun cloning.
2. Explain the construction of genomic library.
3. Short note on construction of c-DNA library.
4. What is PCR and explain any one type.
5. Write about RT –PCR
6. Give short note on real time PCR.
7. What is probe?
8. Write short note on plaque hybridization.
9. Give short note on colony hybridization.
10. Discuss about southern hybridization.

SECTION-C (8 marks)

(Knowledge levels K2 –Understanding, K3 –Applying, K4 Analysing, and K5- Evaluating are followed in relation to Course outcome specified as per Bloom’s Taxonomy)

UNIT-I

1. Give an account on the DNA modifying enzymes and their properties.
2. Write the mode of action of DNA polymerases and terminal transferase.
3. Write a brief note on restriction mapping.
4. Write a brief notes on steps involved in gene cloning with a diagrammatic representation.
5. Discuss about DNA manipulative enzymes in detail.
6. Give a detailed account on linker and adaptor.
7. Write a brief note on homopolymer tailing.
8. Define hosts? Explain the types of host in detail.
9. Discuss briefly about types of restriction enzyme.
10. List out the applications of DNA modifying enzymes.

UNIT-II

1. Give a detailed account on the construction of pBR322.
2. List the advantages and disadvantages of using plasmids and YACs as cloning vectors.
3. Discuss in detail about yeast vectors.
4. What are phagemid? Give a brief account of phagemids used as vectors.
5. Explain the properties and construction of artificial chromosomes.
6. Give a brief note about cosmids.
7. Write about the shuttle vectors in detail.
8. Discuss about phage vectors.
9. Give a brief note on M13 vectors.
10. Write about PUC 18 plasmid vectors briefly.

UNIT -III

1. Define recombinant proteins? Explain about recombinant insulin.
2. What is recombinant vaccine? Explain about the Hepatitis B.
3. Explain the chemical methods of gene transfer. Add a note on their advantages and disadvantages?

4. Explain the biological methods of gene transfer. Add a note on their advantages and disadvantages?
5. Explain the physical methods of gene transfer. Add a note on their advantages and disadvantages?
6. Define expression vector? Explain PET vectors in detail.
7. Give a detailed account on various promoters used in expression vectors.
8. Explain about gene cassettes and gene fusion briefly.
9. Write about the gene fusion in detail and add notes on its advantage.
10. Explain the role of DNA analysis in forensics, agriculture and medicine in detail.

UNIT-IV

1. Explain *invitro* transcription in detail.
2. Explain briefly about cell free translation systems.
3. Define transposon? Explain the mechanism of transposon.
4. Explain about *invitro* translation in detail.
5. Explain operon concept with a diagrammatic representation in detail.
6. Give a brief note on HART.
7. Define site –directed mutagenesis? Explain its types briefly.
8. Explain about the HRT in detail.
9. Define RNA interference? Explain about siRNA in detail.
10. Explain briefly about the metagenomic libraries.

UNIT-V

1. What is hybridization? Explain in detail about DNA and RNA detection method.
2. Discuss in detail about genomic library and its construction.
3. Explain the method of antibody based screening in detail.
4. What are probes? How are they useful in screening methods?
5. Give detailed account on the construction of a c-DNA library.
6. Explain the screening methods of genomic DNA libraries in detail.
7. Brief note on plaque hybridization with a diagrammatic representation.
8. Discuss briefly about colony hybridization with a diagrammatic representation.
9. Write a brief note on northern hybridization with a diagrammatic representation.
10. Explain about southern hybridization with a diagrammatic representation.

SECTION-A

UNIT-1

1. Introduction of foreign gene for improving trait is called
a) Tissue culture b) Vernalization c) **Genetic engineering** d) Eugeneics
2. Genetic engineering is used in
a) Gene therapy b) Vaccine production c) Obtaining transgenics d) **All the above**
3. The humulin was established in
a) 1985 b) **1978** c) 1982 d) 1990
4. Chimaera is otherwise called as
a) Vector b) **rDNA molecule** c) Molecular vehicle d) None of the above
5. Nuclease is otherwise called as
a) Molecular scissor b) Nucleodepolymerase c) Polynucleodase d) **All the above**
6. Bal31 is an example for
a) **Exonuclease** b) Endonuclease c) Ligase d) Polymerase
8. The host in which the parasite undergoes essential development
a) **Definitive host** b) Intermediate host c) Reservoir host d) Paratenic host
9. Which accidental host serves as a holding place for parasite
a) Definitive host b) Intermediate host c) Reservoir host d) **Paratenic host**
10. Exonuclease III has _____ activity
a) 3¹-5¹ exonuclease b) AP endonuclease c) RNAse H d) **All the above**
11. S1 nuclease was purified from
a) *E. coli* b) *A. niger* c) *S. aureus* d) *P. vulgaris*
12. DNase I needs _____ for its activity
a) **Cation** b) Cleavage site c) ATP d) Both b and c
13. Molecular glue is otherwise called as
a) Lipase b) **Ligase** c) Gyrase d) Helicase
14. DNase II was discovered in
a) Bacteria b) Cow pancreas c) **Mammalian cells** d) None of the above
15. Catalytic site for DNase II is
a) **Histidine** b) Arginine c) Lysine d) Leucine

16. Single stranded unpaired extensions formed by restriction enzyme upon cleavage is called as
 a) Blunt ends b) Flush ends c) **Sticky ends** d) None of these
17. Pick up the endo RNAse
 a) **RNAse A** b) RNAse D c) RNAse T d) RNAse R
18. If linker is combined with specific property as selectable marker, it is called as
 a) **Cassette** b) Modified linker c) Adaptor d) Induced linker
19. The technique used to convert blunt end to sticy end is called
 a) Restriction mapping b) **Homopolymer tailing** c) Gene targeting d) Gene manipulation
20. The enzyme used for homopolymer tailing is
 a) Restriction endonuclease b) Alkaline phosphatase c) **Terminal deoxynucleotidyl transferase** d) Ligase.

UNIT-11

21. Expression vector differs from cloning vector in having
 a) Origin of replication b) Marker gene c) Unique restriction site d) **Control elements**
22. In pBR 322, pBR stands for
 a) Plasmid Bacterial Recombination b) Plasmid Bacterial Replication c) **Plasmid Bolivar and Rodriguez** d) Plasmid Baltimore and Rodriguez
23. Vectors designed to replicate in cells of two different species are called
 a) Cosmid b) Transfer vectors c) Phagemid d) **Shuttle vectors**
24. Autonomously replicating sequence (ARS) is a characteristic feature of
 a) Plasmid vectors b) Phage vectors c) *E. coli* vectors d) **Yeast vectors**
25. Select the wrong statement about plasmids?
 a) Extrachromosomal b) Closed and circular c) **Its replication depends on host** d) Double stranded
26. The first engineered plasmid vector is
 a) pBR322 b) PUC vectors c) **pSC101** d) PUC19
27. The most popular and widely used engineered plasmid vector
 a) **pBR 322** b) pUC vectors c) pSC101 d) pUC 19
28. Conjugative plasmids
 a) Exhibit antibiotic resistance b) Do not exhibit antibiotic resistance c) **Carry transfer genes called the *tra* genes** d) Do not carry transfer genes

29. Cos site of the cosmids
a) Consists of 12 bases b) Helps whole genome in circularization and ligation c) **Both a & b**
d) Contains cleavage site
30. M13 is an example of
a) Filamentous phage b) Single stranded DNA c) **Both a and b** d) Plasmid
31. Single stranded vectors are useful
a) For sequencing of cloned DNA b) For oligonucleotide directed mutagenesis c) For probe preparation d) **All the above**
32. Size of the DNA that can be packaged into a λ phage is
a) 50kb b) **35-53kb** c) 40-50kb d) Any size
33. Cosmid vectors are used for
a) Cloning small fragments of DNA b) **Cloning large fragments of DNA** c) Cloning prokaryotic DNA only d) Cloning eukaryotic DNA only
34. Plasmids which are maintained as multiple copy number per cell are known as
a) Stringent plasmids b) **Relaxed plasmids** c) Cryptic plasmids d) None of the above
35. Cosmid lacks
a) **Genes coding for viral proteins** b) Origin of replication c) Marker genes d) Cleavage site
36. Phagemid consist of
a) Plasmid vector carrying λ phage's cos site b) **Plasmid vector carrying λ attachment (λ att) site** c) Plasmid vector carrying origin of replication of λ phage only d) Plasmid vector carrying origin of replication of plasmid only
37. Maximum size of foreign DNA can be inserted into insertion vector is
a) 35kb b) **18kb** c) 50kb d) 27kb
38. Cryptic plasmids
a) **Do not exhibit any phenotypic trait** b) Exhibit many phenotypic trait c) Exhibit one phenotypic trait d) Exhibit antibiotic resistance
39. Charon 34 and Charon 35 are the examples of
a) Plasmid vector b) **Phage vector** c) Cosmid vector d) Phagemid vector
40. P1 cloning vector is the example of
a) Plasmid b) Cosmid c) **Bacteriophage** d) Phagemid

UNIT-111

41. In human insulin, disulfide bond is present in between _____ residues of two chains
a) **Cystine** b) Adenine c) Thymine d) Guanine
42. The protein responsible for the purification of insulin is
a) Permease b) **β -galactosidase** c) Amylase d) Glucosidase
43. Commercially important recombinant hepatitis B virus vaccine was produced by
a) *E. coli* b) Mammalian cells c) **Yeast** d) None of the above
44. Hepatitis B vaccine is come under
a) Attenuated recombinant vaccine b) DNA vaccine c) Vector recombinant vaccine d)
Subunit recombinant vaccine
45. Tiny fat bubbles used to deliver genes are
a) Electropores b) Phospholipids c) Cholesterols d) **Liposomes**
46. The ability of cells to take up DNA fragment from surrounding is called as
a) **Transformation** b) Transfection c) Conjugation d) Transduction
47. The injection of DNA into developing inflorescence using a hypodermic syringe is called
a) Microfection b) Microinjection c) **Macroinjection** d) Micromanipulator
48. The virus mediated gene transfer by genetically modified bacteriophage is called
a) Transformation b) Transfection c) Conjugation d) **Transduction**
49. Strong promoter found in pET expression vector is
a) **T7** b) T5 c) T9 d) T6
50. Pick up the mobile element
a) Integrase b) Integron c) **Gene cassette** d) Fusion protein
51. The first drug produced using RDNA technology
a) **Insulin** b) Streptokinase c) TPA d) EPO
52. There are some advantages of expressing protein as a fusion protein. It may enhance stability, folding, _____ and _____ formation.
a) Solubility, phosphodiester bond formation b) Insolubility, phosphodiester bond formation
c) **Solubility, disulphide bond formation** d) Insolubility, disulphide bond formation
53. A short peptide region fused to a protein of interest is known as
a) **Tag** b) Oligonucleotide c) Fragment d) Dimer

54. The expression of features in gene ecoli
 a) Promoter sequence b) Terminator sequence c) Ribosomal binding site d) **All the above**
55. Protein fusion done at the level of
 a) DNA b) RNA c) **Both DNA and RNA** d) None of the above
56. Fusion proteins
 a) Prevent degradation b) Increase ease of purification c) Only a d) **Both a and b**
57. Thioredoxin proteins contains two residues
 a) **Cysteine** b) Adenine c) Guanine d) Cytosine
58. Entrokinase is an intestinal enzyme that converts to
 a) Pepsinogen, pepsin b) Pepsin, pepsinogen c) **Trypsinogen, trypsin** d) Trypsin, trypsinogen
59. In crime investigation, DNA analysis was first used in
 a) **1984** b) 1990 c) 1990 d) 1992
60. Which of the following bacterium is considered as 'natural genetic engineer'
 a) ***Agrobacterium tumefaciens*** b) *Agrobacterium radiobactor* c) *Psuedomonas putida*
 d) *Thermus aquaticus*

UNIT-1V

61. The IS elements can be identified by the presence of
 a) Antibiotic resistance gene b) Endonuclease cleavage site c) **50bp inverted repeat**
 d) Integrase site
62. Direct repeat in the IS elements are present
 a) Within the transposon b) Upstream the inverted repeat c) **Within the inverted repeat**
 d) Downstream the inverted repeat
63. The enzyme that catalyzes the transposition of and IS elements is called
 a) **Transposase** b) Integrase c) Transcriptase d) Polymerase
64. Non-composite transposons contains
 a) Antibiotic resistant gene b) IR flanking region c) IS elements d) **Both a and b**
65. Copia elements are seen in
 a) Bacteria b) Plants c) Human d) **Drosophila**
66. Ty elements are seen in
 a) **Yeast** b) Plants c) Human d) Drosophila

67. An operon is made up of
a) Promoter b) Operator c) Structural genes d) **All the above**
68. Write down the name of scientist who has discovered the method of site directed mutagenesis?
a) Bostein Shortle b) Craik c) Grait d) **Joller Smith**
69. Concept of operon was coined by
a) Jacob b) Monod c) Bergstrom and Samuelsson d) **Jacob and Monod**
70. Fusion gene can occur as a
a) **Hybrid gene** b) Oncogene c) Both a and b d) Non e of these
71. Fusion gene can occurs as
a) Translocation b) Insertion deletion c) Chromosomal inversion d) **All the above**
72. Phage is used in oligonucleotide directed mutagenesis
a) **M13** b) Cosmid c) Phagemid d) Phage
73. The process of RNA inactivation by siRNA is termed as
a) RNA silencing b) **RNA interference** c) Short RNA inactivation d) Long interspersed RNA
74. DNA methylation is come under _____ gene silencing
a) **Transcriptional** b) Post- transcriptional c) Translational d) None of the above
75. Pick up the element responsible for endogenous gene silencing
a) SiRNA b) **MiRNA** c) HnRNA d) tRNA
76. Down regulation of expression of endogenous genes by transformation with constructs that would generate sense RNA, rather than anti-sense RNA is known as:
a) Suppression b) **Co-suppression** c) Multisuppression d) Anti-suppression
77. The method of post transcriptional gene silencing is particularly useful in:
a) **Plants** b) Animals c) Insects d) Microorganisms
78. Introduction into host organism can also be done by using a DNA construct, which when transcribed, generates a RNA which is _____
a) Circular b) Linear c) Double stranded d) **Self-complementary**
79. A typical cassette should contain
a) Promoter b) Ribosome binding site c) Terminator d) **All the above**

80. Which is the study of genetic material recovered directly from environmental samples
a) Metagenomics b) Ecogenomics c) Environmental genomics d) **All the above**

UNIT-V

81. The short gun method
a) is used in sequencing of genomes requires computers b) **is more accurate than the clone contig method** c) is normally used with large genomes d) takes more time than other genome sequencing approaches
82. Libraries can broadly be classified into how many types
a) 1 b) **2** c) 3 d) 4
83. The various steps for construction of libraries are
(1) fragmentation of DNA (2) isolation of genomic DNA (3) amplification (4) ligation and introduction to the host (5) vector preparation
The correct order of construction of libraries is (in the order of starting to ending)
a) 1>2>3>4>5 b) **2>1>5>4>3** c) 2>5>1>4>3 d) 5>2>1>3>4
84. Libraries using phage cloning vectors are often kept as
a) Unpackaged phage b) **Packaged phage** c) Both packaged and unpackaged phage d) Both a and b are used but packaged is favoured.
85. The PCR variant designed for the study of RNA expression level is
a) **RT PCR** b) qPCR c) Anchored PCR d) Traditional PCR
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a) protein for detecting a specific DNA molecule b) short piece of labeled DNA which are complementary to the nucleic acid strand to be detected c) **short piece of labeled DNA or RNA which are complementary to the nucleic acid strand to be detected** d) none of these
87. Aminobenzylmethyl filter paper is commonly used for transfer in
a) Western blotting b) **Southern blotting** c) Northern blotting d) Dot blotting
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91. In northern hybridization probe hybridization forms
- a) DNA:RNA hybrid b) RNA:DNA hybrid c) **Both a and b** d) None of these
92. For protein detection the most commonly used probe is
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94. What does the acronym PCR stand for
- a) **Polymerase chain reaction** b) Polymerase copying reaction c) Polymerase copied repeats d) Polymerase chain restoration
95. Which of the following serves as the first primer in RT-PCR for eukaryotic RNA
- a) Oligo A b) **Oligo T** c) Oligo G d) Oligo C
96. In RT-PCR the enzyme deoxynucleotide transferase adds poly-G residues in the
- a) 5`end of RNA b) 3`end of RNA c) **3`end of cDNA** d) 5`end of cDNA
97. The digestion of mRNA during RT-PCR is carried out by the enzyme
- a) Exonuclease b) **RNase H** c) Bal31 d) Endonuclease
98. Genomic library is normally made by
- a) α phage vectors b) **λ phage vectors** c) β phage vectors d) γ phage vectors
99. Long probes are usually made by
- a) gene expression b) **cloning** c) hybridization d) PCR
100. Choose the correct statement for RACE.
- a) It stands for Random Amplification of cDNA ends b) **It is for cloning particular cDNA ends** c) It is only of one type, which is 5' RACE d) Sequence data is not available in any case

SECTION-B

UNIT -1

1. Write an essay on genetic engineering.
2. Explain briefly about gene cloning.
3. Write a short note on application of genetic engineering.
4. Give short notes about hosts.
5. Enumerate the properties of ligases. Also, explain the mechanism of ligation.
6. What is restriction mapping?
7. Write a short note on homopolymer tailing.
8. Explain shortly about applications of restriction enzymes.
9. Explain a) linkers and b) adapters
10. Discuss about DNA polymerase in detail.

UNIT-11

1. Write short note on cloning vectors and explain any one of the cloning vectors.
2. Give short notes on plasmid and explain about the PBR322.
3. Draw a construct of plasmid PBR322.
4. Give a neat sketch of plasmid pUC18 vector.
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7. Write short note about pJB8.
8. What is YAC?
9. Give short note on BAC.
10. Discuss about shuttle vectors.

UNIT-111

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2. Write short note on hepatitis.
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4. Write shortly about expression vectors.
5. Explain about the physical and chemical gene transfer method.
6. Write short notes on promoters used in expression systems.
7. Give short notes on gene cassettes.

8. Discuss about gene fusion.
9. List out the advantages of fusion protein.
10. Explain shortly about DNA analysis in medicine.

UNIT-1V

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3. Write short notes on HRT selection.
4. Explain about HART selection.
5. Give short notes on transposons.
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7. Write short notes on operon concept.
8. Give a short account on siRNA.
9. What is miRNA?
10. Explain about metagenomic library.

UNIT-V

1. Write short notes on shot gun cloning.
2. Explain the construction of genomic library.
3. Short note on construction of c-DNA library.
4. What is PCR and explain any one type.
5. Write about RT –PCR
6. Give short note on real time PCR.
7. What is probe?
8. Write short note on plaque hybridization.
9. Give short note on colony hybridization.
10. Discuss about southern hybridization.

SECTION-C

UNIT-I

1. Give an account on the DNA modifying enzymes and their properties.
2. Write the mode of action of DNA polymerases and terminal transferase.
3. Write a brief note on restriction mapping.

4. Write a brief notes on steps involed in gene coloning with a diagrammatic representation.
5. Discuss about DNA manipulative enzymes in detail.
6. Give a detailed account on linker and adaptor.
7. Write a brief note on homopolymer tailing.
8. Define hosts? Explain the types of host in detail.
9. Discuss briefly about types of restriction enzyme.
10. List out the applications of DNA modifying enzymes.

UNIT-11

1. Give a detailed account on the genology of pBR322.
2. List the advantages and disadvantages of using plasmids and YACs as cloning vectors.
3. Discuss in detail about yeast vectors.
4. What are phagemid? Give a brief account of phagemids used as vectors.
5. Explain the properties and construction of artificial chromosomes.
6. Give a brief note about cosmids.
7. Write about the shuttle vectors in detail.
8. Discuss about phage vectors.
9. Give a brief note on M13 vectors.
10. Write about PUC 18 plasmid vectors briefly.

UNIT -111

1. Define recombinant proteins? Explain about recombinant insulin.
2. What is recombinant vaccine? Explain about the Hepatitis B.
3. Explain the chemical methods of gene transfer. Add a note on their advantages and disadvantages?
4. Explain the biological methods of gene transfer. Add a note on their advantages and disadvantages?
5. Explain the physical methods of gene transfer. Add a note on their advantages and disadvantages?
6. Define expression vector? Explain PET vectors in detail.
7. Give a detailed account on various promoters used in expression vectors.
8. Explain about gene cassettes and gene fusion briefly.
9. Write about the gene fusion in detail and add notes on its advantage.

10. Explain the role of DNA analysis in forensics, agriculture and medicine in detail.

UNIT-IV

1. Explain *invitro* transcription and *invitro* translation in detail.
2. Explain briefly about cell free translation systems.
3. Define transposon? Explain the mechanism of transposon.
4. Define transposon? Explain the types of transposon.
5. Explain operon concept with a diagrammatic representation in detail.
6. Give a brief note on gene fusions.
7. Define site –directed mutagenesis? Explain its types briefly.
8. Explain about the RNA interference in detail.
9. Define RNA interference? Explain about siRNA in detail.
10. Explain briefly about the metagenomic libraries.

UNIT-V

1. What is hybridization? Explain in detail about DNA and RNA detection method.
2. Discuss in detail about genomic library and its construction.
3. Explain the method of antibody based screening in detail.
4. What are probes? How are they useful in screening methods?
5. Give detailed account on the construction of a C-DNA library.
6. Explain the screening methods of genomic DNA libraries in detail.
7. Brief note on plaque hybridization with a diagrammatic representation.
8. Discuss briefly about colony hybridization with a diagrammatic representation.
9. Write a brief note on northern hybridization with a diagrammatic representation.
10. Explain about southern hybridization with a diagrammatic representation.

GENETICS

UNIT I

Section – A

1. Who is the father of genetics?
a) Watson and Crick **b) Gregor Johann Mendel** c) Walter Flemming d) T. H. Morgon
2. An organism with two identical allele of a gene in a cell
a) Heterozygous b) Hybrid **c) homozygous** d) Dominant
3. During gamete formation the segregation of the alleles of one allelic pair is independent of the segregation of the alleles of another allelic pair is called -----
a) Segregation b) Continuous variation **c) Independent assortment** d) Discontinuous variation
4. Transfer of characters from one generation to other generation is known as _____
a) Inheritance b) Changes c) Mutation d) Duplication
5. Genes located close together on the same chromosome are called _____
a) Alleles b) Pseudo alleles c) Linked genes d) mutation
6. A set of three or more alleles controlling a same character is called
a) Homozygous alleles b) Heterozygous alleles **c) Multiple alleles** d) Non allelic gene
7. An example of allele is _____
a) AB and Tt b) TT and Tt c) T and t **d) X and Y**
8. Number of characters studied in garden pea by Mendel is
a) Five **b) Seven** c) Six d) Three
9. In the F1 generation of a monohybrid cross, the phenotypic ratio would be
a) 3:1 b) 1:2:1 c) 1:1:2 d) 2:1:1
10. An example of a genotype is
a) A tall pea plant b) R and r **c) TtHH** d) Hemophiliac
11. Which of the following gives information about the phenotype but not the genotype
a) X HY b) Hemophiliac man **c) Tall pea plant** d) Female carrier for colour-blindness.
12. Which blood type would not be possible for children of a type AB mother and a type A father?
a) O b) A c) B d) AB
13. Long radishes crossed with round radishes result in all oval radishes. This type of inheritance is
a) Multiple alleles b) Complete dominance c) Co-dominance **d) Incomplete dominance**
14. If two white sheep produce a black offspring, the parent's genotypes for colour must be
a) Heterozygous b) Homozygous white c) Homozygous black **d) Not enough information**
15. Genetic traits of seeds are noted as follows
a) L = long, l = short b) W = wrinkled, w = smooth
c) Y = yellow, y = white d) R = ribbed, r = grooved
16. Which of the following is the genotype for a short, wrinkled, yellow, grooved seed
a) llWwyyrr b) LLWWyYRr c) LlWwYYRr **d) llWwYYrr**
17. What type of inheritance do two alleles have if their traits blend together?
a) Mendelian inheritance b) Homozygous inheritance c) Co-dominance **d) Incomplete dominance**

18. Snap dragon color is a incomplete dominant trait. A red flower (RR) is crossed with white flower (rr)? What color are flowers that are Rr
 a) Red b) White C) Red and white **d) Pink**
19. Two different mutations within the same gene are in the same _____
 a) **Complementation test** b) Complementation group
 c) Complimentation test d) Complimentation group
20. In humans, one normal trait is determined by incomplete dominance
 a) **Type of hair** b) Type of cyclocolour c) Type of male colour d) Type of skin colour

Key to Section A

1. b	2. c	3. c	4. a	5. a	6. c	7. b	8. b	9. a	10. c
11. c	12. a	13. d	14. d	15. c	16. d	17. d	18. d	19. a	20. a

Section – B

1. Explain the characteristic features of the plant which Mendel chosen for his study.
2. Explain monohybrid cross in pea plant
3. Explain about mendelian principles
4. Give an example for codominance
5. Explain over dominance with an example
6. In pea plants purple flowers are dominant to white flowers. What are the possible phenotypes and genotypes of the offspring?
7. Explain about independent assortment of genes from a dihybrid
8. Explain the inheritance pattern of *Mirabilis jalapa*
9. Draw punnet square for complementation test using *Lathyrus odoratus*
10. Define the following: Phenotype, genotype, homozygous, heterozygous, gene, allele, wild phenotype and mutant phenotype
11. Give a brief account on monohybrid cross in pea plant
12. Detail with example about dominance and recessive relationship
13. Explain dihybrid cross
14. Give a short not on multiple allele
15. Explain the law of segregation
16. Write a note on incomplete dominance
17. Explain the law of dominance and monohybrid ratio
18. Explain incomplete dominance in snap dragons
19. A tall plant cross with dwarf one produces off springs which are one half tall and one half dwarf what are the genotypes of the parents
20. How would you produce 4'o clock plant which would yield pink flowered plant when sown?

Section – C

1. Write an essay on Mendels experiment on garden pea and Mentalial principle.
2. Differentiate Monohybrid ratio with that of dihybrid ratio.
3. Write an essay on Multiple alleles in diploid organism
4. Comment on Non mentalian inheritance and differentiate it with Mentalian inheritance

5. Explain briefly the law of independent assortment with suitable examples.
6. If a red-flowered four 'o' clock plant is crossed with a white flowered one, what will be the flower colour of the F₁, of the F₂, of the offspring of a cross of the F₁ with its red. Parent, with its parent.
7. Assume that a wild type female Drosophylla. BB SS, with normal gray body and red-coloured eyes is mated with a mutant type male, bb ss, with a black bodied colour and sepia coloured eyes. Following the general directions determine the F₁ genotype. After mating F₁ x F₁ what classes of flies may be expected in the F₂ generation.
8. Distinguish between incomplete and co dominance with suitable examples
9. Briefly explain about Codominance and over dominance with suitable examples
10. Briefly explain about Complementation test

UNIT II

Section – A

1. A gene that affects, prevents, or masks the expression of a gene at another locus is a (n) gene
 a) Dominant **b) Epistatic** c) Codominant d) Pleiotropic
2. A Barr body in a mammalian female cell represents:
 a) An inactivated oocyte b) A polar body
 c) A degenerate nucleus **d) An inactivated X chromosome.**
3. The allele which is unable to express its effect in the presence of another is called
 a) Co dominant b) Supplementary c) Complementary **d) Recessive**
4. Multiple alleles control inheritance of
 a) Phenylketonuria b) Colour blindness c) Sickle cell anaemia **d) Blood groups**
5. When a single gene influences more than one trait it is called
 a) Pseudo dominance **b) Pleiotrophy** (c) Epistasis d) None of these
6. These bring about the death their possessor
a) Lethal genes b) Basic gene c) Multiple gene d) Cumulative gene
7. The difference in epistasis and gene interaction is _____
 a) Gene interaction involves two genes b) Epistasis modifies the normal Mendelian ratio
 c) Epistasis involves two gene **d) Gene interaction produces a novel phenotype**
8. In case of comb shape of a chicken, which of the following when inbred will breed true?
 a) Rose b) Pea **c) Walnut** d) Single
9. Which one of the following summer squash would be true breeding?
 a) Sphere b) Disc **c) Long** d) Short
10. Flower colour in sweet pea shows duplicate epistasis, if purple colour is dominant what is the F₂ratio?
 a) 15:1 **b) 9:7** c) 3:1 d) 9:3:4
11. The _____ mouse is lethal.
 a) Homozygous white b) Homozygous black c) Heterozygous agouti **d) Homozygous yellow**
12. Linkage _____ as the distance between two genes _____
a) Decreases, decreases b) Unaffected, Decreases
 c) Decreases, Increases d) Increases, Increases
13. In Drosophila males there is complete linkage. What is the reason behind this?
a) The genes are very closely located b) Coupling theory
 c) No synapsis d) Unknown reason
14. Linkage results in _____
 a) Formation of more Dominant phenotype b) Formation of more Wild phenotype
 c) Formation of more parental phenotype **d) Formation of more recombinant phenotype**
15. Recombination occurs in _____
 a) Single strand stage b) Two strand stage c) Three strand stage **d) Four strand stage**

16. Mammals have _____ type of sex determination.
 a) **XX/ XY** b) XX/ XO c) ZZ/ ZY d) Genic
17. The XO system of sex determination is found in _____
 a) **Insects** b) Birds c) Reptiles d) Mammals
18. If the X/A ratio is 0.5, the individual will be
 a) Intersex b) Normal female c) Super female **d) Normal male**
19. Which of the following is sexlinked
 a) **Colour blindness** b) Malignancy c) Hepatitis d) Lukimia
20. The unit of recombination is called as
 a) Muton **b) Recon** c) Cistron d) All of these

Key to Section A

1. b	2. d	3. d	4.d	5. b	6. a	7. d	8. c	9. c	10. b
11. d	12. a	13. a	14. d	15. d	16. a	17. a	18.d	19. a	20. b

Section – B

- What are complementary genes
- Explain epistasis with a suitable example
- Explain chromosomal theory of inheritance
- Write a short note on linkage
- Write a short note on crossing over
- What is the difference between linkage and crossing over?
- Explain Reciprocal cross with examples
- Write a short note on sex linked inheritance
- Explain sex determination
- Explain about X and Y chromosomes
- Explain cistrons
- What do you know about Recon?
- 12 a) Write about lethality and lethal genes.
- What are the types of crossing over
- Explain about the morgan's experiment of linkage in Drosophila
- a) Give a detailed account on Back cross and Test cross.
- Explain the mechanism of Genic Balance Theory
- a) Briefly explain the dominant epistasis
- Briefly explain the sex linked character of colour blindness
- Illustrate the fine structure of prokaryotic and eukaryotic gene structure

Section – C

- Explain in detail with examples
 i) Complementary genes ii) Reversions iii) epistasis iv) Co-dominance
- Explain the multiple factors of inheritance with examples
- What will be the flower colour of the offspring of the following crosses, in which the genotypes of the parents are given. In sweat peas, genes c or p alone produce. White flowers, the purple colour being due to the presence of both these factors
 CcPp x ccPp ccPp x CCpp CcPp x CcPP Ccpp x CcPp In the above crosses of the sweat peas what are the genotype of the parents.
- Explain sex linked inheritance with example
- Explain prokaryotic gene arrangement

6. Explain eukaryotic gene structure
7. Explain briefly (i) linkage (ii) crossing over (iii) lethal genes (iv) cistron
8. Explain the genetic code and its universality.
9. A woman is known to have heterozygous for haemophilia & colour blindness, both X linked genes. Her father was colour blind with normal blood picture. If she marries a normal man, what phenotypic ratios can she expect (assuming no crossing over occurs in her gametes) (a) in her sons, (b) in her daughters.
10. Explain in detail
 - a) Find structure of gene
 - b) Haemophilia
 - c) Cistron
 - d) Recon

UNIT III

Section – A

1. If the centromere is located close to the end, and giving a very short arm and an exceptionally long arm, the chromosome is called
 - a) **acrocentric**
 - b) telocentric
 - c) submetacentric
 - d) none of the above
2. In genetics, map units express the distance between
 - a) **chromosomes during metaphase**
 - b) two loci on a chromosome
 - c) alleles
 - d) polar bodies
3. A part of a chromosome that links sister chromatids are known as -----
 - a) **Centromere**
 - b) Telomere
 - c) Isochromes
 - d) Kinetochores
4. The portion of chromosome transferred to another chromosome
 - a) **Insertion**
 - b) Deletion
 - c) Inversion
 - d) Translocation
5. The quinacrine mustard is used to stain chromosome is
 - a) **G banding**
 - b) C banding
 - c) R banding
 - d) Q banding
6. FISH stands for
 - a) First induced strand hybrid
 - b) F1 insertion segment homolog
 - c) Flanking insertin sequence hybrid
 - d) **Fluorescent in situ hybridization**
7. In Turner's syndrome the karyotype shows-----
 - a) 47 chromosome (Trisomy of 21)
 - b) 47 chromosome (AA+XXY)
 - c) 46 chromosome (AA+XY or XX)
 - d) **45 chromosome (AA+XO)**
8. In Klinefelter's syndrome the karyotype shows -----
 - a) 47 chromosome (Trisomy of 21)
 - b) **47 chromosome (AA+XXY)**
 - c) 46 chromosome (AA+XY or XX)
 - d) 45 chromosome (AA+XO)
9. In Down's syndrome the karyotype shows-----
 - a) **47 chromosome (Trisomy of 21)**
 - b) 47 chromosome (AA+XXY)
 - c) 46 chromosome (AA+XY or XX)
 - d) 45 chromosome (AA+XO)
10. Down syndrome is also known as _____
 - a) Trisomy 18
 - b) Trisomy 20
 - c) **Trisomy 21**
 - d) Trisomy 24
11. Who discovered sex chromosome
 - a) Robert Brown
 - b) M.J.D. White
 - c) **Nettle Stevens**
 - d) G.J. Mendel
12. Which human chromosomes are involved in Down's syndrome?
 - a) 6
 - b) **14 and 21**
 - c) 8 and 12
 - d) X and Y
13. Which of the following could be due to duplication?
 - a) Co-dominance
 - b) Dominance
 - c) Incomplete dominance
 - d) **Pleiotropy**
14. What will be the effect of the deletion mutation of a gene at the telomere?
 - a) Organism will die
 - b) Organism will develop serious hazards
 - c) Mild effect on the phenotype
 - d) **No effect**

15. Deletion of a region led to over expression of a gene X. What do you conclude from this observation?
 - a) Part of gene X is mutated
 - b) Promoter of gene X is deleted
 - c) Regulator of gene X is deleted**
 - d) No effect on gene X or its regulators
16. Yellow colour of mouse is generated by _____ mutation.
 - a) Duplication
 - b) Deletion**
 - c) Inversion
 - d) Translocation
17. Which of the following has beads on a string structure?
 - a) Chromosomes
 - b) Chromatin
 - c) Nucleosomes**
 - d) Heterochromatin
18. Chromosomes possess a number of longitudinal sub divisions called
 - a) Chiasmata
 - b) Chimera
 - c) Chromonemata**
 - d) None
19. The eukaryotic promoter is called
 - a) Pribnow box**
 - b) TATA box
 - c) ATA box
 - d) CAT box
20. Proof of chromosome theory of inheritance was put forward by;
 - a) Auery & Mc Leord
 - b) Beadle & tatum
 - c) Sutton and Boueri**
 - d) Rosemund & Franklin

Key to Section A

1. a	2. a	3. a	4. a	5. a	6. d	7. d	8. b	9. a	10. c
11. c	12. b	13. d	14. d	15. c	16. b	17. c	18. c	19. a	20. c

Section – B

1. Explain the technique involved in FISH
2. Write a short note on chromosomal changes in its number.
3. Draw a fine structure of chromosomes
4. Describe karyotype of man
5. Explain chromosome mapping
6. Describe about landmarks of chromosomes
7. Explain about banding pattern
8. Define: a) Trisomy b) Aneuploidy c) Polyploidy d) Monosomy
9. Give a shortnotes on chromosomal aberration
10. Give a short note on transposable elements
11. Short notes on a) Translocation b) Duplication
12. Short notes on a) Inversion b) Deletion
13. Define translocation and two types of translocation.
14. Give short notes on a) Klinefelter's syndrome b) Turner's syndrome
15. Short notes on Down's syndrome

Section – C

1. Elaborate the banding pattern of chromosome
2. Briefly explain FISH technique and explain its applications
3. Briefly explain about chromosomal banding pattern
4. Explain about Land marks and karyotyping in man
5. Explain different types of chromosomal variations
6. Discuss about structural chromosomal anomalies
7. Explain different types of chromosome aberrations or chromosome mutations
8. Give brief notes on Klinefelter's syndrome
9. Give brief notes on Turner's syndrome

10. Give brief notes on Down's syndrome

UNIT IV

Section – A

- Changes resulting in abnormal structure of one or more chromosomes are known as
 - Gene mutation
 - Point mutation
 - Chromosomal aberrations**
 - Substitution mutations
- Insertion mutation is also known as
 - Somatic mutation
 - Chromosomal mutation
 - Addition mutation**
 - Substitution mutation
- The type of chromosomal aberration which does not change the number of genes is
 - Deletion
 - Duplication
 - Inversion**
 - Translocation
- A mutation which brings about structural changes in a DNA molecule is known as
 - Somatic mutation
 - Spontaneous mutation
 - Point mutation**
 - Duplication mutation
- The mutation that can be induced by certain chemical mutagens is
 - Deletion mutation
 - Addition mutation
 - Substitution mutation
 - Somatic mutation**
- Deletion mutations are reported in some
 - Fungi
 - Yeasts
 - Chlamydomonas
 - All the above**
- Non-heritable mutations are
 - Point mutation
 - Lethal mutation
 - Gene mutation
 - Somatic mutation**
- How many kinds of mutation are found in DNA which includes mutation of only one base?
 - 1
 - 2**
 - 3
 - 4
- The term mutation coined by
 - Dobehansy
 - De Vries
 - Johanson**
 - Batsen
- A chemical or physical agents that cause mutations is called
 - Mutagen**
 - Mutogen
 - Mutant
 - All of these
- Bacterial recombination causes transformation of the recipient cell to _____
 - donorcell
 - merozygote**
 - zygote
 - recipient cell
- The transfer of genes from one cell to another by a bacteriophage is known as
 - Recombination
 - Conjugation
 - Transduction**
 - Transformation
- The cell in which the F factor carries along with it some chromosomal genes are known as
 - F⁺ cell**
 - F⁻ cell
 - F['] cell
 - F^{''} cell
- Which of the following terms describes a bacterial cell that has lost its ability to synthesize leucine?
 - Hfr
 - F⁻**
 - Auxotrophic
 - Protrophic
- Which method of gene transfer involves direct contact between the bacteria
 - Conjugation**
 - Transduction
 - Transformation
 - all of these
- The bacterial transformation experimentally proved by
 - Watson
 - Mendel
 - Griffith**
 - Morgan
- Virus mediated gene transfer is called
 - Replication
 - Transduction**
 - Evolution
 - Conjugation
- Which of the following role is performed by a bacteriophage in transduction?
 - vector**
 - donor
 - recipient
 - episome
- Fragments transferred by a bacteriophage contains how many genes?
 - 20
 - 50
 - 1
 - 100**

20. When the phage transduces only those bacterial genes adjacent to the prophage in the bacterial chromosome then it is known as?
- a) generalized transduction **b) specialized transduction**
 c) restricted transduction d) conjugation

Key to Section A

1. c	2. c	3. c	4. c	5. d	6. d	7. d	8. b	9. c	10. a
11. b	12. c	13. a	14. b	15. a	16. c	17. b	18. a	19. d	20. b

Section – B

- Short notes on a) Silent mutation b) Missense mutation
- Define Reverse and Suppressor mutations
- Short notes on a) Nonsense mutation b) Frameshift mutation
- Short note on chemical mutagens
- Define point mutation. What are the different types of point mutations?
- Give short notes on a) Spontaneous mutation b) Induced mutation
- Differentiate between Gene mutation and genome mutations.
- Short note on reverse mutation
- Short note on physical mutagens
- Differentiate between intergenic suppression and intragenic suppression.
- What are the mechanisms of genetic exchange in various prokaryotes?
- What is transformation?
- What is transduction?
- What is conjugation?
- Explain the Griffith's experiment of bacterial transformation

Section – C

- Define mutation. What are the different type of mutations?
- Define mutagen. Give short notes on physical and chemical mutagens.
- Explain reverse mutation with suitable examples
- Explain suppressor mutations with suitable examples
- Explain about induced genetic changes with examples
- Explain about the Griffith's experiment demonstrating transformation in *Pneumococcus*.
- Explain the process of conjugation with neat diagram
- Illustrate the lytic cycle of bacteria.
- What is bacteriophage? Add a note on their life cycle.
- Illustrate the transformation done by O.T. Avery, C.M. MacCleod and McCarthy.

UNIT V

Section – A

- What is branch migration?
 - Break and reformation of identical base pairs
 - Formation of lesion
 - Formation of heteroduplex DNA**
 - Dissolution occurs

2. Which type of DNA is connected by a holiday junction?
 a) **Homologous DNA duplex** b) Heteroduplex DNA
 c) Mutated DNA d) Asymmetric DNA
3. What is a crossover product?
 a) Mutated DNA b) Reassorted DNA **c) Crossover DNA** d) Spliced DNA
4. Which of the following is used by microbial genetists as a tool
 a) Bacteriophage **b) Plasmids** c) Transposable element d) All the above
5. The breeding of plants and animals for particular traits by humans is called _____.
 a) natural selection b) sexual recombination c) founder effect **d) artificial selection**
6. Members of the same species which are capable of interbreeding is described as a(n)
a) Population b) community c) Biosphere d) Intron
7. The transfer of genes from one gene pool to another is called
a) Gene flow b) Genetic drift c) Evolution d) Gene mutation
8. Cross breeding is also called as
 a) Mutation b) Deletion **c) Inbreeding** d) out breeding
9. Mating between closely related individuals is called
 a) Outbreeding **b) Inbreeding** c) Mutation d) Recombination
10. If 16% of the persons in a population show a recessive trait, what is the allelic frequency for the dominant allele?
 a) 4% b) 16% **c) 84%** d) 99%
11. A pedigree chart shows:
 a) The genotypic ratios of the offspring b) The types of gametes produced by the parents
c) The pattern of inheritance of a specific gene d) The genotype of any parents
12. How does a geneticist use pedigrees
 a) to create genetic crosses b) to replicate identical strings of DNA
 c) to prove that sex-linked traits are caused by codominant alleles
d) to trace the inheritance of traits over generations of families
13. Genetic disorders are caused by
a) pedigrees b) Mutations c) Dominant alleles d) sickle shaped cells
14. Genetic drift can be defined as
 a) gene flow b) The continental shift of the plates on the earth surface
c) Movement of individuals from land to water d) Change in the gene pool due to random event
15. The _____ is the set of all genes, or genetic information, in any population.
 a) Gene pool b) Founder effect c) Bottle neck effect **d) All of these**
16. When a small number of individuals from a larger population form a new population this is known as
 a) Natural selection **b) Founder effect** c) Gene mutation d) Gene shuffle
17. The transfer of genes from one gene pool to another is called -----
 a) Gene pool b) Evolution **c) Gene flow** d) Gene mutation
18. Crossbreeding is also called as -----
 a) Mutation b) Deletion **c) Inbreeding** d) Outbreeding
19. The total aggregate of alleles in a population is termed as
a) Gene pool b) Allelic frequency c) Genotypical frequenc d) The genetic strength
20. During single gene disorders, inheritance usually occurs in the form of
 a) Autosomal dominant b) Autosomal recessive **c) X-linked** d) All of these

Key to Section A

1. c	2. a	3. c	4. b	5. d	6. a	7. a	8. c	9. b	10. c
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11. c	12. d	13. a	14. c	15. d	16. b	17. c	18. c	19. a	20. c
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Section – B

1. Explain the mechanism of genetic recombination.
2. State Hardy- Weinberg Law. Explain its significance in population.
1. Give an account on gene frequency.
2. Write short note on gene pool.
3. Briefly account on inbreeding.
3. What is outbreeding
4. What is genetic drift
5. What is genetic shift?
6. Write an essay on pedigreeanalysis .
7. Give an account on genetic counseling.
8. Factors influence Hardy- Weinberg Law

Section – C

1. Explain the mechanism of genetic recombination.
2. Explain about Holliday junction with neat illustration
3. State Hardy- Weinberg Law. Explain its significance in population.
4. Write an essay on modern concept of gene
5. What are Inbreeding? Explain in detail with examples
6. What are Outbreeding? Explain in detail with examples.
7. Briefly explain about genetic shift with suitable examples
8. Briefly explain about genetic drift with suitable examples
9. Give a detailed account on Pedigree analysis with illustration.
10. Briefly explain about genetic counselling

KONGUNADU ARTS AND SCIENCE COLLEGE

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QUESTION BANK



II-M.Sc. Biotechnology (2017-2019 Batch)

SUBJECT CODE: 17PBT310

PAPER TITLE: Plant Biotechnology

PG AND RESEARCH DEPARTMENT OF BIOTECHNOLOGY

APRIL 2019

SECTION-A

Choose the correct answer (1 Mark)

UNIT-1

1. Which organelle contains gene for coding large subunit of rubisco protein
(a) **Chloroplast** (b) Nucleus (c) Mitochondria (d) Endoplasmic reticulum
2. Multipartite genome organization was seen in
(a) Chloroplast (b) Nucleus (c) **Mitochondria** (d) Endoplasmic reticulum
3. Number of protein units involved in nucleosome bead formation
(a) 4 (b) 5 (c) 6 (d) **8**
4. Pick out the first generation DNA marker
(a) SCAR (b) SNP (c) **RFLP** (d) AFLP
5. Random primers should have minimum
(a) **40% GC** (b) 45% GC (c) 50% GC (d) 60% GC
6. QTL is used
(a) to investigate number of genes for the trait (b) to find out gene location for the trait
(c) to find the dosage effect of genes for the trait (d) **a, b and c are correct**
7. Microsatellites otherwise called as
(a) **SSR Marker** (b) VNTR Marker (c) SNP Marker (d) All the above
8. Pick out the sequence useful for physical and genetic mapping
(a) **STS** (b) RFLP (c) AFLP (d) SSLP
9. Allelic variation can be detected from
(a) Dominant marker (b) **Co dominant marker** (c) DNA marker (d) Classical marker
10. Pick out the non PCR based marker
(a) RAPD (b) **RFLP** (c) SSLP (d) AFLP
11. QTL is a
(a) Gene independent (b) Single gene (c) Cluster of genes (d) **Both b and c**
12. If A and B genes are tightly linked then their inherited ratio will be
(a) **High** (b) Small (c) Recombination dependent (d) Recombination independent
13. Positional cloning was achieved by requiring
(a) Co segregating marker (b) Cloning vectors (d) **both a and b** (d) None of the above
14. Three types of selection methods was achieved in
(a) **Marker assisted backcrossing** (b) gene pyramiding (c) Marker assisted recurrent selection (d) Genomic selection

15. Marker assisted selection based on marker score is achieved in
(a) Marker assisted backcrossing (b) gene pyramiding (c) **Marker assisted recurrent selection** (d) Genomic selection
16. Marker assisted multiple trait concept was seen in
(a) Marker assisted backcrossing (b) **gene pyramiding** (c) Marker assisted recurrent selection (d) Genomic selection
17. Selective amplification of restricted fragments was achieved by
(a) **AFLP** (b) RFLP (c) RAPD (c) SSLP
18. Single strand polymorphism was detected by
(a) AFLP (b) SNP (c) SSR (c) **SSLP**
19. Semi-autonomous bodies in plant cell are
(a) Nucleus and chloroplast (b) Mitochondria and Nucleus (c) **Mitochondria and Chloroplast** (d) Chloroplast and Golgi complex
20. Rubisco protein coded by
(a) **Nucleus and chloroplast** (b) Mitochondria and Nucleus (c) Mitochondria and Chloroplast (d) Chloroplast and Golgi complex

UNIT-2

21. Plant cells are
(a) Multipotent (b) **Totipotent** (c) Pluripotent (d) Omnipotent
22. Organism genetically identical to its parent is termed as
(a) Chimera (b) Cybrid (c) **Clone** (d) Habituate
23. The cytokinin found in nature
(a) IAA (b) IBA (c) 2,4-d (d) **Zeatin**
24. The explant used for true haploid plant production is
(a) Embryo (b) Seed (c) **Pollen** (d) Shoot tip
25. The main purpose for synthetic seed preparation is
(a) Germination (b) Propagation (c) **Preservation** (d) Cultivation
26. Specific medium designed for callus induction
(a) MS medium (b) **Gamborg medium** (c) Hildebrandt (d) N6 medium
27. The auxin found in nature
(a) **IAA** (b) IBA (c) 2,4-d (d) Zeatin

28. The meristemic region taken as explant for micropropagation
(a) Nodal region (b) Root tip (c) Shoot tip (d) **All the above**
29. Indirect plant regeneration
(a) Shoot tip culture (b) Embryo culture (c) **Callus culture** (d) Root tip culture
30. Pick up the single cell culture technique
(a) Droplet culture (b) Feeder layer technique (c) Hanging droplet culture (d) **Filter paper raft nurse culture**
31. In general, protoplast culture is followed by
(a) Somatic embryogenesis (b) **Somatic hybridization** (c) Cell suspension (d) Plant regeneration
32. Plant used for studying recessive genes
(a) Aneuploid plant (b) **Haploid plant** (c) Diploid plant (d) *In vitro* raised plant
33. Embryo formed from unfertilized egg is called as
(a) Nucellar embryo (b) Androgenetic embryo (c) Adventitive embryo (d) **Parthenogenetic embryo**
34. The order of embryo development stages
(a) **Globular-Heart-Torpedo** (b) Torpedo-Heart-Globular (c) Heart-Torpedo-Globular (d) Heart-Globular-Torpedo
35. Pick out the root inducing hormone
(a) IAA (b) 2,4-d (c) **IBA** (d) NAA
36. TIR1 receptor is used to
(a) **Destruct auxin repressor** (b) transport cytokinin (c) activate nuclear transcriptional factor of cytokinin gene (d) detach shuttle protein
37. Gibberellic acid was isolated from gibberella infected rice plant in crystalline form by
(a) Kurosowa (b) Yabuta and T. Hayashi (c) **Brian, et al** (d) Cross *et al*
38. Pick out the ripening hormone
(a) Abscisic acid (b) Auxin (c) **Ethylene** (d) Gibberellic acid
39. Morphaine alkaloid from *Papaver somniferum* which relieves pain
(a) **Opium** (b) Vincristine (c) Scopalamine (d) Atropine
40. Enhancement of secondary metabolite production through tissue culture technique by
(a) Elicitor (b) Metabolic engineering (c) Hairy root (d) **All the above**

UNIT-3

41. Shuttle vector is comprised of
- (a) Binary & Helper Ti Plasmid (b) **Disarmed Ti Plasmid & Helper Ti Plasmid**
- (c) Binary & Co-integrate Plasmid (d) Co-integrate & Helper Ti Plasmid
42. The most necessary component used for transformation is
- (a) ORI (b) **Vir gene** (c) Gene of interest (d) All the above
43. 16S rRNA of chloroplast genome is sensitive to
- (a) Ampicillin (b) **Streptomycin** (c) Kanamycin (d) Penicillin
44. Pick out the master gene for virulence in Ti plasmid
- (a) **Vir A** (b) Vir B (c) Vir C (d) Vir D
45. Wounded plants which oozes out phenolic compound to heal is
- (a) Kaemferol (b) **Acetosyringone** (c) Quercetin (d) Tannin
46. Single T strand was synthesised by
- (a) **VirD1/VirD2** (b) Vir B (c) Vir E1/E2 (d) Vir G
47. The connection between plant cell and agrobacterium and T-DNA transfer was facilitated by
- (a) VirD1/VirD2 (b) **Vir B** (c) Vir E1/E2 (d) Vir G
48. T-DNA was guided to nuclear pore complex
- (a) **VIP I** (b) VIP II (c) psc A (d) Tra I
49. The single strand binding protein which protects T-strand is coded by
- (a) Vir D1 (b) Vir D2 (c) Vir B (d) **Vir E2**
50. Vir A protein has
- (a) 2 domains (b) **3 domains** (c) 4 domains (d) 5 domains
51. Thin root and nodule formation in hairy root disease was facilitated by
- (a) **Rol B and C** (b) Rol A and B (c) Rol C and D (d) tms1 and tms2
52. Production of auxin in hairy root disease was facilitated by
- (a) Rol B and C (b) Rol A and B (c) Rol C and D (d) **tms1 and tms2**
53. Most widely seen strain in *A. rhizogene* infected plant is
- (a) **Agropine** (b) Mannopine (c) Cucumopine (d) Mikimopine
54. Chloroplast genome is functionally as
- (a) Monocistronic (b) **Polycistronic** (c) Bicistronic (d) Tricistronic

55. Transplastomic plants in which genes have been inserted in
 (a) **Chloroplast** (b) Mitochondria (c) Nucleus (d) Cytosol
56. Selectable marker used in chloroplast transformation is aadA which is resistant to
 (a) Ampicillin (b) **Streptomycin** (c) Ampicillin (d) Penicillin
57. Stronger promoter in chloroplast is
 (a) rrm gene (b) **rrn gene** (c) rrl gene (d) rra gene
58. Gene tagging can be used for
 (a) Detecting site directed mutagenesis (b) Genomic library construction
 (c) Knockout gene (d) **All the above**
59. Ri plasmid has been well studied in
 (a) *A. thaliana* (b) *N. tabacum* (c) ***W. somnifera*** (d) *C. roseus*
60. Gene responsible for auxin production in *A. tumefaciens* is
 (a) **tms** (b) tml (c) tmr (d) tmf

UNIT-4

61. The strong promoter in cauliflower mosaic virus is
 (a) 16S RNA (b) **35S RNA** (c) 19S RNA (d) 5S RNA
62. Pick out the selectable marker gene for transformants selection
 (a) GFP (b) LUC (c) GUS (d) **HPT**
63. The transgenic plant which inhibits EPSP is resistant to
 (a) Virus (b) Insect (c) **Herbicide** (d) Drought
64. The seeds become infertile due to
 (a) **Lethal gene** (b) Recombinase gene (c) Repressible gene (d) All the above
65. 35S RNA has
 (a) 5 ORF (b) 6 ORF (c) **7 ORF** (d) 8 ORF
66. Capsid protein of CaMV is coded by
 (a) II ORF (b) III ORF (c) **IV ORF** (d) V ORF
67. Insect transmission factor is coded by
 (a) **II ORF** (b) III ORF (c) IV ORF (d) V ORF
68. The efficiency of transformation increases when the process is carried out in
 conjunction
 (a) **PEG** (b) PVA (c) PVP (d) SDS
69. The detection assay of the enzyme luciferase is based on the principle of
 (a) **Bioluminescence** (b) FACS (c) Flow cytometry (d) All the above

70. The genome of cauliflower mosaic virus is
 (a) **8 Kb** (b) 10 Kb (c) 12 Kb (d) 20 KB
71. A commercially produced particle bombardment apparatus namely _____ is widely used
 (a) **PDS-1000/HC** (b) PTS-1000/HC (c) PDS-100/HS (d) PTS-100/HC
72. _____ is the direct physical method involving the mechanical insertion of the desirable DNA into a target cell
 (a) Electroporation (b) Gene gun (c) Lipofection (d) **Microinjection**
73. The microprojectile bombardment method was first invented by
 (a) Smith (b) **Sanford** (c) Morel (d) Ishiwaki
74. EPSPS gene is used for producing _____ transgenic plant.
 (a) **Herbicide resistance** (b) Drought tolerance (c) Salt tolerance (d) Pest resistance
75. Which among the following is a herbicide cum auxin?
 (a) **Phosphinothricin** (b) 2, 4-D (c) Glyphosate (d) Bavistin
76. The gene responsible for resveratrol synthesis is
 (a) HM1 (b) RP52 (c) **STS** (d) Ct9
77. The gene code for polygalacturonase which is responsible for tomato softening is
 (a) pTOM5 (b) **pTOM6** (c) pTOM12 (d) pTOM13
78. Cry 3 protein is toxic to
 (a) Diptera (b) Lepidoptera (c) **Coleoptera** (d) Lepidoptera and Diptera
79. Causes for gene silencing
 (a) DNA methylation (b) Position effect (c) Histone modification (d) **All the above**
80. Cre enzyme recognize
 (a) **Lox site** (b) FRT (c) RS (d) RP

UNIT-5

81. Glycine betaine is a
 (a) **Osmolyte** (b) Herbicide (c) Fungicide (d) Insecticide
82. The protein which acts as anticoagulant
 (a) Avidin (b) Tricosanthin (c) Phytase (d) **Hirudin**
83. The need of metabolic engineering
 (a) to produce novel compound (b) to produce less specific unwanted compound
 (c) to produce more desired compound (d) **All the above**

84. DREB is essential for
(a) **Cold resistance** (b) Herbicide resistance (c) Drought resistance (d) Insect resistance
85. HVA1 gene is responsible for
(a) Cold resistance (b) Herbicide resistance (c) **Drought resistance** (d) Insect resistance
86. mtID gene is responsible for
(a) Cold resistance (b) Herbicide resistance (c) **Salt tolerance** (d) Insect resistance
87. The gene code for glutathione-s-transferase which shows resistance against NaCl was obtained from
(a) ***Prosopis juliflora*** (b) *Escherichia coli* (c) *Avicenia marina* (d) *Bacillus subtilis*
88. The enzyme is suitable for making plant to be used as cattle feed
(a) Avidin (b) **Phytase** (c) Tricosanthin (d) Hirudin
89. The deficiency of _____ causes Gaucher disease
(a) Vitreoscilla haemoglobin (b) Tricosanthin (c) Avidin (d) **Glucocerebrosidase**
90. The precursor for indole alkaloid biosynthesis pathway is
(a) **Tryptophan** (b) Lysine (c) Tyrosine (d) Ornithine
91. The precursor for tropane alkaloid biosynthesis pathway is
(a) Tryptophan (b) Lysine (c) Tyrosine (d) **Ornithine**
92. The order of biosynthesizing polyhydroxybutyrate is
(a) **Condensation>Reduction>Polymerization**
(b) Reduction>Condensation>Polymerization
(c) Polymerization>Condensation>Reduction
(d) Polymerization>Reduction>Condensation
93. Pha B gene is responsible for _____ in PHB synthesis
(a) Condensation (b) Polymerization (c) **Reduction** (d) Acetylation
94. The advantage of plantigen production
(a) Cost effective (b) Reduce downstream process (c) Edible vaccine (d) **All the above**
95. The plantibody produced by four transgenic tobacco lines through crossing is
(a) IgG (b) **sIgA** (c) IgM (d) IgD
96. The first plantibody produced by transgenic tobacco is
(a) IgG2 (b) IgG4 (c) IgG3 (d) **IgG1**

97. The protein used for purifying our desired recombinant product is
a) Avidin (b) Tricosanthin (c) Phytase (d) **Oleasin**
98. Pelargonidin is responsible for
(a) **Orange colour** (b) Red colour (c) Violet colour (d) Blue colour
99. The transcriptional factor for flavonoid synthesis is
(a) CH1 (b) C1 (b) LC (c) CH1 and LC (d) **LC and C1**
100. The flavonoid which relieves hypertension is
(a) **Ajmalicine** (b) Tabersonine (c) Vincristine (d) Vinblastine

SECTION-B (5 Marks)

UNIT-1

1. Give short note on chloroplast genome organization.
2. Brief account on mitochondrial genome organization
3. Explain about lineage analysis.
4. Write short note on RAPD marker.
5. Give short notes on QTL mapping.
6. What is chromosome walking?
7. Explain about gene pyramiding.
8. Give short note on microsatellites.
9. What is chromosome landing?
10. Brief account on SCAR.

UNIT-2

11. Write short notes on callus induction.
12. Briefly explain the sterilization techniques in a PTC laboratory.
13. Give an account on major types of media
14. Give an account on laboratory organization of plant tissue culture.
15. Write short notes on gibberellic acid biosynthesis.
16. Brief account on synthetic seed preparation
17. Explain the techniques for single cell culture.
18. List out important secondary metabolites with their significances.
19. Explain the way to find out the genetic variation between *invivo* and *in vitro* raised plants.
20. Write short notes on factors influencing micropropagation.

UNIT-3

21. Explain the construction and properties of binary vector.
22. Sort note on co-integrate vector.
23. Describe the mechanical method of gene transfer. List out its merits and demerits.
24. Give short note on electroporation
25. Explain about chemical mediated gene transfer methods.
26. What are opines? Outline the classification of Ti plasmids based on opines.
27. Give an account on the binary vector systems with suitable examples.
28. Short notes on vir genes
29. What is gene tagging?
30. Give short note on advantages of chloroplast transformation.

UNIT-4

31. List out the reporter genes used for selection of transformants.
32. Write short note on CaMV genome with neat diagram.
33. Give short note on lethal gene.
34. Give a brief note on pathogenesis related proteins.
35. Write short note on gene construct.
36. Explain about BT cotton.
37. Write a short note on antisense RNA technology with suitable example.
38. Explain about Gemini virus with a neat diagram.
39. Write a short note on disadvantages of marker genes.
40. Explain about difference between selectable and screenable marker genes.

UNIT-5

41. Explain shortly about the advantages of plantibody.
42. Give short note on influence of abiotic stress in plant growth and development.
43. Give a brief account on cold resistant plant.
44. Write short note on salt and drought resistant genes.
45. List out the advantages of biodegradable plastics.
46. List out some plantigens with their significances.
47. Explain the advantages of plantigens.
48. Give a short note on biosynthesis of indole alkaloid biosynthesis pathway.
49. Write a short note on genes involved in flavonoid biosynthesis.
50. List out some recombinant proteins produced by plant expression system.

SECTION-C (8 Marks)

UNIT-1

1. Describe RFLP in detail.
2. Explain plant nuclear genome organization in detail.
3. Give a brief note on AFLP.
4. Give a detail account on QTL.
5. Explain chloroplast genome organization in detail.
6. Discuss briefly about marker based selection.
7. What is marker and elaborate its role in breeding.
8. Describe briefly about satellites.
9. Give a brief account on PCR based markers.
10. Write a brief note on marker based cloning strategies.

UNIT-2

11. What are growth regulators and give some account on auxins and cytokinins.
12. What is micropropagation and describe the techniques/stages involved in micropropagation with a net sketch.
13. Describe the procedure involved in haploid production.
14. Give a brief account on somatic embryogenesis.
15. Give an account on PTC laboratory organization.
16. Discuss about the types of plant tissue culture medium and add notes on role of medium constituents.
17. Explain protoplast isolation in detail.
18. Give a brief note on callus induction,
19. Explain the strategies involved in secondary metabolite production under *in vitro*.
20. Describe briefly about cell suspension culture.

UNIT-3

21. Describe briefly about indirect gene transfer techniques.
22. What is plasmid and explain both binary and co-integrate vector systems used for transformations.
23. Describe T-DNA transfer mechanism in detail.
24. Explain chloroplast transformation in detail.
25. Describe the organization of Ti plasmid and Ri plasmid.

26. Describe the chemical methods of gene transfer into plant cells with suitable examples.
27. Describe the biolistic method of direct DNA delivery. Highlight its advantages and disadvantages.
28. Explain the application of gene transfer methods in detail.
29. Give a brief account on hairy root disease.
30. Elaborate physical methods of gene transfer.

UNIT-4

31. Give a brief note on Gemini viral vector.
32. Give a detail account on selectable marker with suitable examples.
33. What is a reporter gene? Explain some of them in detail.
34. Describe briefly about endogenous gene silencing mechanism especially in plants.
35. Explain about exogenous SiRNA technology in detail.
36. Give a brief account on marker free transgenics.
37. Give a brief account on terminator technology.
38. Describe BT cotton and flavr savr tomato in detail.
39. Explain briefly about herbicide and insect resistant transgenic plants.
40. Brief note on CaMV viral vector.

UNIT-5

41. Explain salt and drought resistant transgenic plants in detail.
42. Describe plantibody production in detail.
43. Write a brief note on strategies for plantigen production.
44. Give detailed account on PHB production.
45. Describe briefly about alkaloid biosynthesis.
46. Give detail account on role of metabolic engineering in flavonoid biosynthesis.
47. List out some recombinant proteins produced by plant expression system.
48. Write the advantages of plantibody and plantigen.
49. Write a note on genetic engineering strategy to obtain a transgenic plant.
50. Explain cold resistant transgenic plants in detail.

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QUESTION BANK

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Section A

Choose the best answer

- Father of Immunology is
(a) Metchnikoff **(b) Louis Pasteur** (c) Edward Jenner (d) Jules Border
- Acquired immunity is developed by
(a) Colostrums (b) Serum (c) Antigens **(d) All the above**
- Anti-tetanus serum provides
(a) Natural passive immunity **(b) Artificial passive immunity**
(c) Natural active immunity (d) artificial active immunity
- Which of the following is an example of passive immunity?
(a) A cell –mediated immune response to TB, in a tuberculosis patient
(b) Anti-tetanus antibodies in the plasma of an immunodeficient individual, derived from administration of pooled antibody.
(c) Lifelong protection against measles, after recovery from this disease.
(d) Ig A antibodies in the intestinal tract of a 25-years old person.
- Chronic inflammation is characterized by
(a) Tissue infiltration by mononuclear cells (b) Short duration
(c) **Tissue infiltration by neutrophils** (d) Rapid onset
- Acquired humoral immunity results from the presence of
(a) Complement (b) Lysozyme
(c) **Antibodies** (d) activated macrophages
- A difference between specific and non-specific immunity is memory. Which of the following describes the feature memory for more specific immunity?
(a) Increased Immune Response on re-exposure to Ag
(b) Recongnizing Ag specifically
(c) Time between Ist encountering Ag and making an immune response
(d) a and c
- Which of the following is NOT a function of the monocyte-macrophage cell line

- (a) Ag presentation of T cells **(b) Secretion of cytokinase**
(c) Phagocytosis (d) Ag presentation to B cells

9. Macrophage can also function as

- (a) NK cells **(b) Antigen presenting cell** (c) Mast cell (d) Megakaryocyte.

10. Null cells are

- (a) Th cells (b) Tc cells **(c) LAK cells** (d) All the above

11. The following are true with natural killer (NK) cells, except one

- (a) They play an important role in antiviral immunity
(b) They play an important role in antitumor immunity
(c) they are dependant on antibody for their activity
(d) Interferons increase NK cell activity.

12. The following cells are known as granulocytes except one

- (a) Neutrophil (b) Eosinophil **(c) Macrophage** (d) Lymphocyte

13. Which of the following factors is part of natural or non-specific immunity?

- (a) Lymphocytes **(b) Macrophage** (c) Memory (d) a and c

14. A characteristic of specific immunity?

- (a) Redness (b) Inflammation **(c) Memory** (d) Lack of specificity

15. Humoral immunity refers to which of the following elements?

- (a) Antibodies (b) Macrophage (c) Complement **(d) a and c**

16. Innate and adaptive immunity work together in providing host defenses to infection. Adaptive immunity, however, has one main feature that does not participate in innate immunity. This feature is

24. Which of the following is a characteristic of an immunogen?

- (a) It contains protein (b) It is complex
(c) It is not recognized as self (d) **All the above**

25. The size of a B cell epitope is related to

- (a) Its composition (b) The amount of processing it undergoes
(c) The size of the antigen binding region on the Ab (d) **(a) and (c)**

26. The superbug is called

- (a) *Pseudomonas* (b) *Bacillus* (c) *Salmonella* (d) *Proteus*

27. The minimum molecular weight required for particle to induce immune response is

- (a) 5kDa (b) 15kDa (c) 25kDa (d) **10kDa**

28. Forssman antigen is

- (a) Organ specific antigen (b) Sequestered antigen
(c) **Heterophile antigen** (d) Human leukocyte antigen.

29. Which of the following substances MOST likely is a superantigen?

- (a) botulinum toxin (b) tetanus toxin
(c) Hetrophile antigen (d) **Staphylococcal entro toxin.**

30. The term adjuvant refers to any substance that

- (a) **Enhances the immunogenicity of an antigen**
(b) Increase the concentration and persistence of the circulating antibody
(c) Induce or enhance the degree of cellular immunity
(d) Inhibits immune response

31. If an epitope is a protein, it is an epitope specifically recognizable by which type(s) of cell.

- (a) B cells (b) Macrophages (c) T cells **(d) a and c**

32. One of these is not a property of antigen

- (a) they contain epitope (b) they will react with antibodies
(c) they contain antigenic determinants **(d) they contain paratopes**

33. Which of the following is a cardinal feature of immunogenicity?

- (a) Foreignness (b) Route of immunization (c) Molecular size **(d) a and c**

34. The basic monomer structure of an Ig molecule contains which of the following?

- (a) Heavy chains (b) Light chain (c) Hinge region **(d) all of the above**

35. Antibodies are

- (a) oligosaccharides **(b) glycoproteins** (c) Lipopolysaccharides (d) Glycerides

36. Individuals unable to make the J protein found in certain immunoglobulins would be expected to have frequent infections of the

- (a) brain (b) blood **(c) liver** (d) intestinal tract

37. The antibody class which can pass through the placenta to protect the foetus is

- (a) IgA** (b) IgE (c) IgM (d) IgG

38. The only antibody that comes from the human placenta is

- (a) IgA** (b) IgE (c) IgD (d) IgG

39. The most abundant immunoglobulin in the blood is

- (a) IgA (b) IgE (c) IgD **(d) IgG**

40. Idiotype refers to

- (a) Antigen **(b) Antibody** (c) ICAM (d) MHC

41. The T3 complex of the T-cell receptor

(a) Probably functions to transduce a signal to the cell's interior following binding of complexed antigen.

(b) Binds complement

(c) Causes the histamine,

(d) mediates Immunoglobulin class switching.

42. IgE

(a) Binds to mast cells

(b) can cross the placental barrier,

(c) can be modified by the Cholera toxin.

(d) is secretory antibody.

43. Which of the following are not true statements

(a) IgM and IgG can fix complement.

(b) IgA is a secretory immunoglobulin,

(c) IgE mediates Immediate hypersensitivity

(d) IgD provides most passive acquired maternal immunity.

44. A critical property of an antigen is

(a) Its ability to stimulate an immune response

(b) a unique topological feature called a paratope.

(c) a unique topological feature called an epitope.

(d) bind epitope

45. Class II MHC proteins are

(a) Recognized by the T4 (or CD4) protein

(b) used to mark a cell for killing by cytotoxic T-cells

(c) Recognized by the T8 (or CD8) protein

(d) not able to carry an antigen fragments.

46. The major histocompatibility complex proteins function to

(a) degrades T4 and T8 polypeptides.

(b) bind antibody for lymphokine production

(c) bind complement for cell lysis,

(d) bind antigen fragments for presentation to T-cells.

47. The ligand bound by the alpha /beta T-cell receptors of a CD4+ helper T cell which responds to tetanus toxoid is

(a) Intact tetanus toxoid

(b) A peptide derived from tetanus toxoid.

(c) A peptide derived from tetanus toxoid , bound to a Class II MHC gene product/beta 2-microglobulin heterodimer

(d) A peptide derived from tetanus toxoid, bound to a Class II MHC protein heterodimer.

48. Cytolytic T lymphocytes kill their target cells by secretion of

(a) Pore-forming proteins and protease.

(b) Fas and fas ligand

(c) Complement and acute-phase proteins.

(d) Soluble T-cell receptors proteins

49. The ligand-bound receptor then activates a

(a) **Small G protein**

(b) Large GTP –binding protein

(c) Phospholipase C

(d) Protein kinase

50. There is much current interest in the therapeutic use of cytokines to regulate immunity and inflammation. A cytokine that might be used to decrease inflammation would be.

(a) Tumor Necrosis Factor [TNF]

(b) **Interleukin I [IL-1]**

(c) Interleukin 6[IL-6]

(d) Transforming Growth Factor beta [TGF-beta]

51. One principal function of complement is to

(a) inactivate perforins

(b) mediate the release of histamine

(c) **Bind antibodies attached to cell surfaces and to lyse these cells**

(d) Cross link allergens

52. One principal function of the Class I and Class II major histocompatibility complex protein is to

(a) The T-cell interior following antigen binding

(b) mediate immunoglobulin class switching

(c) **Present antigen for recognition by the T-cell antigen receptors**

(d) Stimulate production of interleukins

53. CD4 is seen in

(a) Tc cells

(b) Neutrophils

(c) Basophils

(d) Th cells

54. The major role of the complement system is to work in conjunction with

(a) antibodies to lyse cells via the C8 and C9 components

(b) the major histocompatibility complex for cell recognitions

(c) antibodies to opsonize cells

(d) the T-cells receptor for production of lymphokines

55. Which of the following does not involved cell –mediated immunity?

(a) Contact sensitivity to lipstick

(b) rejection of a liver graft

(c) Serum sickness

(d) tuberculin reaction

56. A positive delayed –type hypersensitivity skin reaction involved the interaction of

(a) antigen, complement, and cytokinase

(b) antigen ,antigen- sensitive lymphocytes, and macrophages

(c) antigen-antibody complexes, complement, and neutrophils,

(d) Suppressed by antihistamine.

57. Cell mediated immune responses are

(a) enhanced by depletion of complement.

(b) Suppressed by cortisone.

(c) enhanced by depletion of T-cells.

(d) Suppressed by antihistamine.

58. The immunosuppressive agent that selectively inhibits T-cell activity

(a) methotrexate

(b) beta-mercaptapurines

(c) 5- flurouracil

(d) cyclosporine.

59. Lymphokines have the role of inducing

(a) Cancer cells

(b) Nerve cells

(c) Bone marrow

(d) B-cells

60. The biological effect of C3 a is

(a) Viral neutralization

(b) Anaphylataxic and chemotaxic

(c) Initiation of membrane damage

(d) Lysis of cell

61. The appearance of many primary lymphoreticular tumors in humans has been correlated with

(a) Hypergammaglobulinemia

(b) acquired hemolytic anemia

(c) BCG treatment.

(d) impairment of cell-mediated immunity.

62. The rejection of tumor may involve

(a) T cell mediated cytotoxicity

(b) ADCC

(c) complement dependent cytotoxicity

(d) all of the above

63. When an immune response occurs in a lymph node, dividing B cells are located in the

- (a) High-endothelial venules (b) Medullary cords.
(c) **Germinal centers** (d) White pulp.

64. The following are true with anaphylaxis, except one

- (a) Primary mediator of anaphylaxis is adrenaline,
(b) The term was coined by Richet
(c) The meaning of the term is 'without protection'

(d) It is an immediate hypersensitivity reaction.

65. Prausnitz Kustner reaction is mediated by

- (a) IgA (b) IgG (c) **IgE** (d) IgD

66. DTH reactively is used in the diagnosis of

- (a) Tuberculosis
(b) **Candida infection.**
(c) Coccidioimycosis
(d) Blastomycosis

67. Many allergic disorders are cured by giving

- (a) Insulin (b) Tolbutamine (c) **Antihistamines** (d) Antigen

68. Rheumatoid arthritis occurs due to

- (a) Streptococcus (b) **Immuneresponse** (c) Graft rejection (d) Erythroblastosis

69. The Ab predominantly formed in an allergic reaction is

- (a) IgA (b) IgG (c) **IgE** (d) IgD

70. RAST test performed to test presence of

- (a) **Allergy** (b) Autoimmunodisease
(c) Tuberculosis (d) none of the above

71. In graft rejection T-cell recognize.

- (a) HLA Class I antigen (b) HLA Class II antigen
(c) HLA Class III antigen (d) **None of the above**

72. Hyperacute graft rejection is associated with

- (a) Activated macrophages (b) **higher-titer antibodies to MHC determinants.**
(c) IgE (d) basophils

73. Xenograft rejection is associated with

- (a) Hypersensitivity (b) Immunogenicity (c) **MHC** (d) All

74. Graft transplantation between genetically unrelated members of same species is known as

- (a) autograft (b) Isograft (c) **allograft** (d) Xenograft.

75. The well known immunosuppressor is

- (a) Magic bullet (b) MoAb (c) **prednisone** (d) $\text{TNF}\alpha$

76. In tumor therapy, the following antibody is used

- (a) **Antibody plus ricin** (b) Antibody alone
(c) GUY'S 13Ab (d) MoAb

77. Immunotoxin are used in

- (a) ELISA (b) Radio immuno assay

(c) Polyclonal antibodies

(d) Monoclonal antibodies as magic bullets.

78. Autoimmune disease

(a) Arthritis

(b) HIV

(c) Diabetes

(d) Typhoid

79. Which one of the following is an organ specific autoimmune disease

(a) Rheumatoid arthritis

(b) Rheumatic fever

(c) Grave's disease

(d) Lupus erythematosus

80. Which one of the following is an autoimmune disease

(a) AIDS

(b) Hay fever

(c) Diabetes

(d) Treponema

81. A pathogenic organism is one that

a) grows not causing disease

b) does not cause disease

c) stimulates an immune response

d) causes disease

82. An exotoxin is a

a) toxin that works outside the body

b) protein toxin with specific activity

c) bacterial lipopolysaccharide

d) viral subunit.

83. A retrovirus is a virus that

a) uses DNA as its nuclear material

b) uses a reverse transcriptase

c) cause cancer in animals

d) has a cell surface envelope

84. Immunosuppression causes increased susceptibility to

a) protozoan

b) viral disease

c) bacterial disease

d) rickettsial disease.

85. T cells constitute approximately which of the following percentage of peripheral blood lymphocytes?

a) **10%**

b) 50%

c) 70%

d) 100%

86. On the basis of morphology , T and B –cell can be distinguished by

a) Size differences

b) microvillous projections on cell surfaces

c) cytoplasmic structures

d) none of the above

87. The Fcγ₂ molecule on B-cell surfaces binds

a) C3b

b) IgG

c) IgA

d) CD8

88. The CD45 molecule is a

a) tyrosine kinase

b) serine kinase

c) phosphotyrosine phosphatase

d) complement receptor

89. One characteristic cell surface molecule largely restricted to human thymocytes is

a) CD4

b) CD8

c) TCR

d) Thy-1

90. One potent T-cell mitogen is

a) phytohemagglutinin

b) complement

c) Immunoglobulin

d) endotoxin

91. The flow cytometer is an instrument that

a) separates blood cells

b) detects different leukocytes populations

c) measures T-cell responses

d) diagnosis AIDS

92. CD8 is a receptor for

a) antigens

b) MHC class II molecules

c) part of the BCR

d) MHC class I molecules

93. In addition to T cells and B cells , there is a third distinct type of lymphocyte called

a) MHC cells

b) IgG cells

c) Langerhans cells

d) NK cells

94. The CD4 molecule is

a) a heterodimer

b) a receptor for MHC class II molecules

c) part of the BCR

d) a complement receptor

95. Interferon γ enhances

a) ADCC

b) NK- cells

c) Macrophage activity

d) T – cell mediated cytotoxicity

96. Three major cytokines secreted by macrophages are

a) IL- 1, IL- 2, and IL-3

b) IL- 2, IFN- γ , and IL-12

c) IL-1,IL-12, and TNF- α

d) IL-1, IFN- γ , and TNF- α

97. Which of these is not a lymphokine?

a) Interferon

b) Histamine

c) lymphotoxin

d) tumor necrosis factor

98. Interleukin-2 is produced by

a) B- cells

b) Th 1 cells

c) macrophages

d) Th 2 cells

100. Which of the following cytokines play a role in terminating inflammatory response?

a) interleukin-2

b) interleukin-4

c) interleukin-6

d) TGF-beta

SECTION – B**5 Marks**

1. Development of immunology in the 19th and 20th century. Discuss.
2. Differentiate between innate and adaptive immunity.
3. Give a brief account on the classification of immune system.
4. Comment on significance of macrophages in immune response.
5. Bring out the role of macrophages in immune reactions.
6. Write a note on primary lymphoid organs.
7. Bring out the maturation, activation, proliferation and differentiation of B cells.
8. Write about antigen presenting cells.
9. Write a note on Primary and secondary immune response.
10. How is antigen recognized by the immune system.
11. What is antigen? Mention different kinds of antigen.
12. Write a note on - (i) adjuvants (ii) Adjuvants
13. Explain Hapten-carrier effect.
14. What is meant by cross reactivity. Explain with examples.
15. How is immunoglobulin synthesized?
16. Describe the antigen-antibody reactions.
17. Draw the structure of various immunoglobulin domains and explain them.
18. Describe the gene rearrangement in the light chain of an immunoglobulin.
19. Give a short account on antibody diversity.
20. Mention the uses of antibodies
21. What are idiotypes? Discuss it briefly.
22. Differentiate active and passive haemagglutination.
23. Describe MHC class II molecule.
24. Explain the function of MHC in antigen processing and presentation.
25. Give an account of lymphocyte sub-populations of mouse and man.

26. HLA in human health and diseases- discuss.
27. Describe B cell activation by Thymus dependent and thymus independent antigens.
28. Mention the role of T-helper cells.
29. Write about T_H cells.
30. State the role of NK cells in immune response.
31. Comment on the significance of antigen processing and presentation.
32. Write a brief note on the two antigen processing pathway.
33. Comment on nature and significance of T-cell-B-cell interaction.
34. Explain the process of ADCC and the cells participating in it.
35. What are T- dependent antigens. Explain.
36. Describe any two cytokine related diseases.
37. List out the biological functions of cytokines.
38. Describe the complement activation system. Mention its significance.
39. Write about the biological functions of complement proteins.
40. What is complement fixation test. Outline the steps involved in the same.
41. Differentiate between classical and alternate pathway of complement activation.
42. Explain Type I hypersensitivity reactions.
43. Give a short note on anaphylactic hypersensitivity.
44. Write a note on transplantation immunity.
45. Write the mechanism of graft rejection.
46. Write a note on immunosurveillance.
47. What is immune tolerance? Discuss.
48. Explain immunosuppression with an example.
49. What is autoimmune disease? Explain it with an example.
50. Illustrate recombinant vector vaccines.

SECTION – C**8 Marks**

1. Give a detailed account on humoral and cell-mediated immunity.
2. Describe the different types of immunity.
3. Discuss the roles of different types of immunity.
4. Describe different types of immunity. Add a note on their significance.
5. Explain the differentiation of T- and B- lymphocytes.
6. Explain various lymphocyte classes and their functions.
7. Comment on hematopoiesis and regulation of hematopoiesis.
8. What are immunoglobulins? Explain the structure and biological properties of Ig classes.
9. Explain the ultra structure of an immunoglobulin.
10. Describe the structures of different antibodies. Compare and contrast them.
11. Compare the structures of different antibodies you have studied.
12. Define primary and secondary antigen-antibody reaction. Give two examples each of the lab methods to detect them.
13. Discuss precipitation and agglutination reactions with an example in each case.
14. Explain affinity maturation and class switching in B cell maturation process.
15. With illustrations explain the lymphocyte re-circulation in the lymph node.
16. State the relationship between MHC expression and antigen processing.
17. Describe the structure and functions of MHC molecules.
18. Describe the structure, distribution and functions of different antibodies.
19. Describe the structure and functions of MHC class I and class II molecules.
20. Write the roles of macrophages and cell-mediated cytotoxicity.
21. Describe cell-mediated cytotoxicity.
22. Give an account on cell mediated immunity.
23. Write notes on TNF and CSF.

24. What are interleukins? Explain their role in B- cell activation.
25. What is lymphokine? Mention its different kinds. How are they synthesized? Add a note on their functions.
26. What are lymphokines? Mention the different kinds and their roles.
27. Give an account on immuno-regulation and immunological tolerance.
28. Discuss the central role of T-helper cells in immune regulation.
29. Discuss about alternate pathway of complement activation system.
30. Write in detail about the activation of complement system and add a note on their functions.
31. Elucidate classical and alternative pathway of complement system and its regulation.
32. Explain the classical pathway of complement activation.
33. Describe different hypersensitive reactions you have studied.
34. Describe different types of hypersensitive reactions. Cite examples.
35. Write an essay on transplantation immunology with special reference to allograft rejection.
36. Give a detailed account of cytokines. Add a note on their roles.
37. Give a detailed account of tumor immunology. How can it be controlled.
38. What is immune suppression? List out the chemicals used as immuno suppressants. Add a note on their mechanism of action.
39. What is immunosuppression? How is it brought about? Mention the molecular mechanism involved?
40. Write notes on production of monoclonal antibodies
41. Discuss briefly on cancer immunology.
42. Discuss the molecular mechanism of tumor induction and the role of immunology.
43. Explain the immune mechanism in systemic Lupus Erythematosus and Rheumatoid Arthritis.

44. Explain the immunological basis of myasthenia gravis and notes on the clinical science of the disease.
45. What is autoimmune disease? Explain with a suitable example.
46. Describe different types of immunity. Add a note on immunodeficiency virus.
47. Discuss about humoral and cell mediated immunodeficiencies.
48. What are the immunological abnormalities in AIDS? Add a note on gene therapy and AIDS vaccine.
49. Discuss the triggering mechanism of immune system to infectious pathogens. Add a note on immune surveillance and immune suppression.
50. Applications of monoclonal antibodies.

Marine Biotechnology

Unit I

1. A group of individuals of the same species
 - A. Community
 - B. Population**
 - C. Niche
 - D. Habitat
2. Symbiosis where one species benefits and the other is not affected
 - A. Marriage
 - B. Commensalism
 - C. Mutualism**
 - D. Parasitism
3. The study of the relationship between an organism and its environment
 - A. Eubonics
 - B. Eubonics
 - C. Ecology**
 - D. Ethics
4. Symbiosis that is similar to predation
 - A. Marriage
 - B. Mutualism
 - C. Commensalism
 - D. Parasitism**
5. How an organism gets its food
 - A. Trophism
 - B. Food Lion
 - C. Trophies
 - D. Consumers**
6. The boundary between land and sea, exposed to air at low tide
 - A. splash - spray zone
 - B. intertidal zone
 - C. benthic**
 - D. pelagic

7. organisms that take energy from the environment and make food
- A. netric
 - B. producers**
 - C. heterotrophs
 - D. consumers
8. deep ocean zone
- A. haldal
 - B. abyss
 - C. pelagic
 - D. benthic**
9. competition between different species
- A. photosynthesis
 - B. intra specific competition
 - C. symbiosis
 - D. inter specific competition**
10. organisms that feed on autotrophs and heterotrophs
- A. heterotrophs**
 - B. tropics
 - C. autotrophs
 - D. producers
11. Groups of marine life includes
- A. plankton
 - B. nekton
 - C. Benthos
 - D. all of them**
12. Whales and dolphins are included in group called
- A. plankton
 - B. nekton**
 - C. Benthos
 - D. all of them
13. Plant and animal like organisms which are found in ocean are called
- A. plankton**
 - B. nekton
 - C. Benthos

- D. all of them
14. Benthos group organisms live on
- A. **ocean floor**
 - B. ocean surface
 - C. deep sea
 - D. ocean basin
15. Benthos includes organisms like
- A. **star fish**
 - B. sea lion
 - C. dolphins
 - D. all of them
16. Upper part of sea/aquatic ecosystem contains
- (a) **plankton**
 - (b) nekton
 - (c) plankton and nekton
 - (d) benthos.
17. Competition for light, nutrients and space is most severe between
- (a) closely related organism growing in different niches
 - (b) **closely related organisms growing in the same area/niche**
 - (c) distantly related organisms growing in the same habitat
 - (d) distantly related organisms growing in different niches. (1988)
18. What is true of ecosystem?
- (a) primary consumers are least dependent upon producers
 - (b) primary consumers out-number producers
 - (c) **producers are more than primary consumers**
 - (d) secondary consumers are the largest and most powerful.
19. In an ecosystem, which one shows one-way passage
- (a) free energy
 - (b) carbon
 - (c) nitrogen
 - (d) potassium.
20. . The relation between algae and fungi in lichen is
- (a) **symbiosis**
 - (b) parasitism

- (c) commensalism
- (d) protooperation.

Unit II

1. Which one is an oceanographic instrument platform used for making subsurface measurements in the ocean
 - A. **Float**
 - B. Boat
 - C. Rotor
 - D. Drifter
2. Which one is a type of sonar used to determine the depth of water by transmitting sound waves into water
 - A. **Echo sounding**
 - B. Active sounder
 - C. Continuous drifters
 - D. Mooring drifter
3. Modern drifters are typically tracked by satellite, often GPS. They are sometimes called
 - A. **Lagrangian drifters**
 - B. Echo sounding
 - C. Active sounder
 - D. Continuous drifters
4. Which one in oceanography is a collection of devices, connected to a wire and anchored on the sea floor
 - A. **mooring**
 - B. echoing
 - C. drifting
 - D. sounding
5. Which one is NASA was an Earth observation satellite carrying the SeaWinds scatterometer
 - A. **QuikSCAT**
 - B. QuakeSCAT
 - C. QuicSCT
 - D. EarthSCAT

6. A satellite-borne sensor designed to collect global ocean biological data
 - A. **SeaWIFS**
 - B. SeaWEFS
 - C. SeaHIFS
 - D. SeaIFS
7. What are instruments which collect weather and ocean data within the world's oceans
 - A. **Weather buoys**
 - B. Humidity buoys
 - C. Weather drifting
 - D. Weather echoing
8. The refractive index of the ocean water:
 - A. decreases with temperature
 - B. decreases with salinity
 - C. increases with temperature
 - D. **increases with salinity**
9. Which one of the following quantities forms the basis of radiometry?
 - A. Radiant energy (Q)
 - B. Radiant flux (φ)
 - C. Radiant intensity (I)
 - D. **All of these**
10. Landsat program began in
 - A. **1972**
 - B. 2003
 - C. 1973
 - D. 1937
11. Remote sensing includes gathering of
 - A. **Images**
 - B. Changes
 - C. Movements
 - D. sounds
12. Remote sensing can be as basic as
 - A. putting cameras on camels
 - B. TV remotes

- C. **putting cameras on airplanes**
 - D. putting sensors on satellites
13. First satellite of NASA was
- A. Sputnik 2
 - B. Explorer 1
 - C. Sputnik 1
 - D. **Terra 1**
14. A rise in sea level near shore due to strong winds is called
- A. swell
 - B. tsunami
 - C. **storm surge**
 - D. whitecap
15. A highest point in a wave is its
- A. troughs
 - B. **crest**
 - C. wave length
 - D. wave direction
16. Area between two breaker zones is called
- A. **surf**
 - B. breaker
 - C. undertow
 - D. long shore
17. Surface facing moon needs to come back on same place after
- A. **24 hours**
 - B. 48 hours
 - C. 56 hours
 - D. 12 hours
18. Area where wave tumble first is called
- A. surf
 - B. **breaker**
 - C. undertow
 - D. long shore

19. Gas released during Bhopal tragedy was

- (a) **Methyl isocyanate**
- (b) Potassium isothiocyanate
- (c) Sodium isothiocyanate
- (d) Ethyl isothiocyanate.

20. Greenhouse effect is warming due to

- (a) Infra-red rays reaching earth
- (b) Moisture layer in atmosphere
- (c) **Increase in temperature due to increase in carbon dioxide concentration of atmosphere**
- (d) Ozone layer of atmosphere.

Unit III.

- 1) The process of weakening a pathogen is called
 - a) Vaccination
 - b) Attenuation**
 - c) Immunization
 - d) Virulence reduction
- 2) The first vaccine developed by Louis Pasteur was against
 - a) Pox virus
 - b) Hepatitis virus
 - c) Rabies virus**
 - d) None of these
- 3) A vaccine can be
 - a) An antigenic protein
 - b) Weakened pathogen
 - c) Live attenuated pathogen
 - d) all of these**
- 4) Passive immunisation include
 - a) Introduction of antibodies directly
 - b) Transfer of maternal antibodies across placenta
 - c) Transfer of lymphocyte directly
 - d) all of these**

- 5) Which of the following statement is true regarding vaccination
- a) **Vaccination is a method of active immunisation**
 - b) Vaccination is a method of passive immunisation
 - c) Vaccination is a method of artificial passive immunisation
 - d) Vaccination is a method of natural passive immunization
- 6) Active immunity may be gained by
- a) Natural infection
 - b) Vaccines
 - c) Toxoids
 - d) **all of these**
- 7) Which of the following is a combined vaccine
- a) Hepatitis B vaccine
 - b) Hib vaccine
 - c) Var vaccine
 - d) **DPT vaccine**
- 8) The first recombinant antigen vaccine approved for human use is
- a) **Hepatitis B vaccine**
 - b) Hib vaccine
 - c) Var vaccine
 - d) DPT vaccine
- 9) Which of the following agents cause death to the cell by coagulation of cytoplasmic proteins?
- a) Alcohol
 - b) Dyes
 - c) Chlorine
 - d) **Heavy metals**
- 10) Which gram negative bacteria is more susceptible to higher concentrations of triphenylmethane dyes.
- a) **E.coli**
 - b) Klebsiella
 - c) Staphylococcus
 - d) Streptococcus

- 11) Which of the following is an acridine dye?
- a) Crystal violet
 - b) Malachite green
 - c) Tryptoflavine**
 - d) Brilliant green
12. Polyvinylpyrrolidone (PVP) is a complex belonging to which group?
- a) Phenolic compounds
 - b) Iodophors**
 - c) Metals
 - d) Aldehyde
13. Which of the following agents irreversibly oxidize and inactivate proteins with sulphhydryl groups?
- a) Alcohol
 - b) Phenol
 - c) Iodine**
 - d) Chlorine
14. Chlorinated lime is the alternative name for
- a) Calcium hypochlorite**
 - b) Sodium hypochlorite
 - c) Chloramine-T
 - d) Azochloramide
15. What is meant by a lead compound in medicinal chemistry?
- a) A drug containing the element lead.
 - b) A leading drug in a particular area of medicine.
 - c) A compound that acts as the starting point for drug design and development.**
 - d) A drug which is normally the first to be prescribed for a particular ailment.
16. Which of the following needs to be established before the search for a lead compound takes place?
- a) the pharmacophore
 - b) Structure-activity relationships
 - c) a bioassay**
 - d) patents

17. What is the term used for the automated *in vitro* testing of large numbers of compounds using genetically modified cells?
- a) Robotic testing
 - b) High throughput screening**
 - c) Multiscreening
 - d) Nanotechnology
18. Which of the following statements is false with respect to NMR screening to detect drug-target interactions?
- a) The procedure relies on small molecules (drugs) having shorter relaxation times than large molecules (targets).**
 - b) The procedure can be used on mixtures of compounds.
 - c) The method can detect weak binding.
 - d) The method can identify small molecules binding to different regions of the same binding site.
19. BIAcore is a detection system patented by Pharmacia Biosensor to detect a ligand binding to a target. What is the name of the phenomenon used in this detection procedure?
- a) Nuclear magnetic resonance
 - b) Electron spin resonance
 - c) Surface plasmon resonance**
 - d) Scintillation proximate assay
20. There are several sources and methods of discovering new compounds. Which of the following is most likely to lead to the discovery of a complex structure quite unlike any other previously discovered?
- a) Combinatorial chemistry
 - b) Database mining
 - c) Screening plant extracts**
 - d) Drugs
21. Which source has been particularly fruitful in finding novel antitumour agents such as bryostatins and dolostatins?
- a) Marine sources
 - b) Venoms and toxins
 - c) Combinatorial chemistry
 - d) Animals

22. Which of the following drugs was not isolated from a natural source?
- a) Quinine
 - b) Morphine
 - c) Isoniazid**
 - d) Artemisinin
23. What is the term used for drugs that are similar in structure to a known drug and which are used for the same purpose?
- a) 'copycat' drugs
 - b) 'me-too' drugs
 - c) 'derivative' drugs
 - d) 'analogue' drugs**

Unit IV

1. slight differences in their DNA—can help predict how quickly they will metabolise particular drugs; this is called
 - a) Pharmacogenomics**
 - b) Pharmacology
 - c) Pharmaco metabolomics
 - d) Pharmaco transcriptomics
2. The process of introduction of weakened pathogen into human body is called
 - a) Immunization
 - b) Vaccination**
 - c) Attenuation
 - d) None of these
3. The first vaccine was developed by
 - a) Louis Pasteur**
 - b) Edward Jenner
 - c) Carl Landsteiner
 - d) Joseph Miester
4. The concept of vaccination was first developed by
 - a) Louis Pasteur
 - b) Edward Jenner**
 - c) Carl Landsteiner
 - d) Joseph Miester

5. Gene transfer to fish is generally carried out using
 - a) YAC vectors
 - b) Electroporation
 - c) Microinjection**
 - d) Ultracentrifugation

6. Which organism can be used to study gene function?
 - a) Zebrafish**
 - b) Snail
 - c) Snake
 - d) Tiger

7. Salmon and trout are
 - a) Hybrids
 - b) Commercially important**
 - c) Protein producers
 - d) Transgenic fish

8. Gene transfer technology in fish has lagged behind that in
 - a) Bacteria
 - b) Virus
 - c) Mammals**
 - d) Plants

9. The first transgenic fish carried transgenes driven by
 - a) Mammals**
 - b) Xenopus
 - c) Virus
 - d) Bacteria

10. Attempts to express growth hormones were initially done with
- a) Salmon
 - b) Xenopus
 - c) Octopus
 - d) Trout**
11. Fish are advantageous assay systems because of their
- a) Size
 - b) Fecundity**
 - c) Nutritional requirements
 - d) Environment
12. How many kinds of embryos can be produced using fish for the purpose of transgenesis?
- a) 1
 - b) 2**
 - c) 3
 - d) 4
13. Fish, like frogs can be used for
- a) Integrative
 - b) Non-functional
 - c) Transient**
 - d) Permanent
14. Transgenic fish lines are created by what kind of DNA into the genome.
- a) Excision
 - b) Partial attachment
 - c) Inactivation
 - d) Integration**

15. Which of the following components of biological membrane are amphipathic?
- a. Integral membrane proteins
 - b. Phospholipids**
 - c. Glycolipids
 - d. Membrane steroids such as cholesterol, sitosterol and ergosterol
16. Membrane proteins may be attached to the membrane by which of the following types of interaction?
- a. Ionic interactions (salt links)
 - b. Hydrophobic interactions
 - c. á helical or â sheet domains containing hydrophobic amino acid residues are used to attach some types of membrane proteins to the lipid bilayer.
 - d. Covalent bonds with membrane lipids**
17. Which of the following statements is true of Na⁺/K⁺-adenosine triphosphatases?
- a. They use the free energy from the hydrolysis of ATP to transport K⁺ out the cell and Na⁺ into the cell.
 - b. They are tetramers, consisting of four equally sized polypeptide chains.
 - c. They indirectly control the volume of the cell.**
 - d. Their actions maintain a membrane potential with a value often of approximately -60 mV; the interior of the cell being positive with respect to the exterior.
18. Both the Na⁺/glucose symporter and Na⁺/K⁺-adenosine triphosphatase of enterocytes use free energy from the hydrolysis of ATP to drive the transmembrane transport of their respective solutes.
- a. True
 - b. False**
19. With respect to their surrounding membrane system, which is the odd one out?
- a. Nucleus.
 - b. Endoplasmic reticulum.**
 - c. Mitochondria.
 - d. Chloroplasts.

20. Which of the following might legitimately be considered part of the endomembrane system? Please select all that apply.
- a. **Rough endoplasmic reticulum**
 - b. Transitional endoplasmic reticulum
 - c. Smooth endoplasmic reticulum
 - d. Outer mitochondrial membrane
21. Hemidesmosomes and desmosomes are both connected to microfilaments are called
- a. **Tonofilaments.**
 - b. Filaments
 - c. Membrane
 - d. Cell wall
22. Which of the following apply to intercellular junctions?
- a. The three major adhesive junctions of animal cells are adherens junctions, desmosomes and hemidesmosomes.
 - b. Desmosomes and hemidesmosomes connect epithelial cells to their basement membrane and adjacent cells respectively.
 - c. **Gap junctions and plasmodesmata are homologous structures.**
 - d. The junctional complexes of gastrointestinal enterocytes ensure that nutrients are only absorbed through the spaces between the cells, which prevents them absorbing potentially harmful substances.
23. Which of the following applies to membrane lipids? Please select all that apply
- a) Membrane lipids are composed of hydrophobic molecules.
 - b) **Scramblases and flippases are able to catalyze the transfer of lipid molecules between the outer and inner leaflets.**
 - c) Membrane lipids are able to spontaneously move between the outer and inner leaflets.
 - d) **Different lipid compositions are found in the two leaflets of a membrane.**

Unit V

1. What are sources of toxic wastes in marine life?
 - A. Metals from mining
 - B. Industries
 - C. Pesticides from farms
 - D. **All of them**

2. What are sources of radioactive wastes in marine?
 - A. discharge from nuclear power stations
 - B. Reprocessing plants
 - C. Military Wastes
 - D. All of them**
3. What are sources of sediments in causing marine pollution?
 - A. Deforestation
 - B. Soil erosion
 - C. Mining & Farming
 - D. All of them**
4. What are sources of pathogenic organism on marine pollution?
 - A. Sewage
 - B. Livestock Waste
 - C. Both A & B**
 - D. None of them
5. Over 75% of marine pollution comes from
 - A. Land**
 - B. Oceans
 - C. Seas
 - D. Coastal Areas
6. Which is the most input of waste causing marine pollution?
 - a) Pesticides
 - b) Pipes directly discharge waste into the sea**
 - c) Death of aquatic organisms
 - d) Climatic conditions
7. Why ship accidents cause marine pollution?
 - a) Because if the ship carrying passengers to collapse it results in the death of many people
 - b) Because ship is very huge in its size
 - c) Dredged material which carries heavy metals cause marine pollution**
 - d) Ship materials stuck inside the marine organisms

8. Which of the following is the greatest volume of waste discharge to water?
- a) Spillage from oil pipelines
 - b) Sewage**
 - c) Nuclear waste
 - d) Spillage from tankers
9. The natural process of emulsification of oil in water can be accelerated through the use of
- a) Chemical dispersants.**
 - b) Nanoparticles
 - c) Sand
 - d) Sodium chloride
10. When does the rate of aerobic oxidation reduced in the sewage that is reduced to the water?
- a) When oxygen concentration falls below 1.5 mg/l**
 - b) When oxygen concentration falls below 2.5 mg/l
 - c) When oxygen concentration falls below 3.5 mg/l
 - d) When oxygen concentration falls below 4.5 mg/l
11. Which of the following way is used to reduce the pollution load on marine water?
- a) Manual cleaning of pollutants
 - b) Damping the pollutants during winter
 - c) Introducing sewage treatment plants**
 - d) Ban the license of industries which are near to the sea
12. The Deep water Horizon oil spill spoiled by
- a) Ships**
 - b) Humans
 - c) Volcanos
 - d) Marine organisms

13. What is the reason that oil pollution attracts the greatest attention?
- a) Because of the volume
 - b) Because of the density
 - c) Because of the mass
 - d) Because of the visibility**
14. Plasmids encoding antigenic protein from a pathogen that is directly injected into the cells where it express constitute
- a) Protein vaccines
 - b) Nucleotide vaccines
 - c) DNA vaccines**
 - d) Recombined vaccines
15. How much percentage of aqueous solution of phenol rapidly kills the vegetative cells of microorganisms?
- a) 1%
 - b) 2%
 - c) 5%**
 - d) 10%
16. The antimicrobial activity of phenolics is not reduced at which of the following conditions?
- a) Acidic pH
 - b) Alkaline pH
 - c) Low temperatures
 - d) Presence of soap**
17. Alcohol concentrations above 60% are effective against
- a) Bacteria
 - b) Fungi
 - c) Germs
 - d) Viruses**
18. Chloramines are more stable than
- a) Hypochlorite.**
 - b) Sodium chloride
 - c) Sucrose
 - d) Silver nitrate**

19. Solutions of sodium hypochlorite of a 1% concentration are used for
- a) Sanitizing dairy equipment's
 - b) Personal hygiene and a household disinfectant**
 - c) Household bleaches
 - d) Disinfecting open wounds
20. Which among the following is an example of organic compound of mercury?
- a) Mercuric chloride
 - b) Mercuric oxide
 - c) Mercurochrome**
 - d) Ammoniated mercury

Unit I

5 marks:

1. Explain the types of marine ecosystems?
2. Describe intertidal zone and the ecology of estuaries?
3. Explain the factors for marine life and habitat?
4. Write briefly on salt marshes and mangrove swamps?
5. Explain the different diversity of marine ecology?
6. Write briefly on salt coral reefs and the deep sea?
7. Explain the use of marine life in medicine?
8. Write briefly on inhabitants of sea water?
9. Write briefly on Plankton with examples?
10. Write briefly on nekton and benthos?

8 marks:

1. Describe in brief about mangrove swamps and coral reefs?
2. Write a detail on marine ecosystem?
3. Describe in detail on Plankton?
4. Explain the morphology of coral reefs with structures?
5. What the different types of corals, explain in detail?
6. Explain the morphology of salt marshes, mangrove swamps with structures?
7. What the different ecosystems found around India with its significance?
8. What are marine aquarium and how to maintain them?
9. Describe in detail on nekton?
10. Describe in detail on benthos with examples?

Unit II

5 marks

1. Briefly explain the Composition of seawater?
2. Illustrate the structure of bioluminescent bacteria?
3. Explain carbon sequestration?
4. Explain the different elements in sea water?
5. Explain the technology behind ocean remote sensing?
6. Describe the different ocean sampling procedures?
7. Write briefly on remote sensing instruments?
8. Explain briefly on marine drifters and mooring?
9. Explain the applications of ocean sensing?
10. Explain the role of different elements in sea water?

8 marks

1. Explain the composition and the elements in seawater?
2. What are the Applications of ocean remote sensing?
3. Explain the qualities of bioluminescent bacteria with a neat sketch?
4. Write in detail on the types of Oceanographic instruments?
5. Describe the evolution and development of marine ecosystems?
6. Explain carbon Sequestration, its significance?
7. Mention how Sequestration of Carbon is done and its applications?
8. Briefly write an essay in sampling procedures?
9. Explain the different elements in sea water in detail? What are its role?
10. Explain the mooring technique in detail?

Unit III

5 marks:

1. Explain unculturable bacteria, its occurrence and exploitation?
2. Describe the characteristics of unculturable bacteria?
3. What are the different characterization methods used for identifying an organism?
4. Differentiate culturable and unculturable bacteria?
5. What are the sources for antimicrobial production?
6. Explain the sources for antioxidants production?
7. Briefly write on bioactive compounds?
8. Describe the production of antioxidants from Sponges and Corals?

9. Explain the production of antioxidants from Bryozoans and Tunicates using a flow chart?
10. Explain the role of bioactive compounds in medicine?

8 marks:

1. Write in detail on Biofouling and prevention?
2. Write on the different sources of antimicrobials and antioxidants?
3. What are unculturable bacteria and how do they occur?
4. Explain the techniques used in growing unculturable bacteria?
5. How unculturable bacteria are grown *invitro*?
6. Describe the production of antioxidants from Sponges and Corals?
7. Explain the production of antioxidants from Bryozoans and Tunicates using a flow chart?
8. Explain the role of bioactive compounds in medicine?
9. Write in detail on different characterization methods for unculturable bacteria?
10. Explain the applications of biofouling and its role?

Unit IV

5marks

1. Describe the types of vaccines?
2. What is role of GH in transgenic fish?
3. Explain what are antifreeze genes?
4. Different methods of vaccine production?
5. How are marine viruses classified?
6. What are the effects of red sea tide on marine ecosystem?
7. Briefly explain on adhesive protein?
8. Explain on the sources of adhesive protein production?
9. How are microbes used as a carbon source?
10. Explain probiotic bacteria with a neat sketch?

8 marks

1. What are vaccines and the methods of production?
2. Write in detail on the development and types of vaccines?

3. Explain the significance of GH in transgenics?
4. What are the qualities and factors of a probiotic bacteria?
5. Explain the importance of probiotics in agriculture?
6. Explain the different methods of characterization of microbes?
7. State the significance of vaccines in aquaculture?
8. Explain in detail on the types of viruses?
9. What is red sea tide? Explain the control measures?
10. What are role of adhesive protein and its production?

Unit V

5 marks:

1. What are the commercial importance of enzymes?
2. Give the production methods of enzymes?
3. Explain batch fermentation with diagram?
4. Explain fed-batch fermentation with diagram?
5. Draw a bioreactors and label its parts?
6. Illustrate the structure of giant bacteria? Give its significance?
7. Explain marine pollution with examples?
8. Sketch a neat diagram of giant bacteria and mark its parts?
9. Give the ecological significance of giant bacteria?
10. What are the different types of marine pollution?

8 marks

1. Explain the production of Xylanase, agarose from microorganisms?
2. Explain the production of proteases, chitinases from microorganisms?
3. Describe the types of microbial enzymes and its importance?
4. Explain the production of enzymes by using bioreactors?
5. Write in detail on the types of marine pollution with examples?
6. What are the different control measures for marine pollution?
7. Write in detail on giant bacteria and explain their ecological significance?
8. Explain how to characterize a commercially important microorganism?
9. What are roles and the uses of commercially important enzymes?
10. Write briefly on microbial strain development?

KONGUNADU ARTS AND SCIENCE COLLEGE
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QUESTION BANK



III-B.Sc. Biotechnology (2017-2020 batch)

SUBJECT CODE: 17UBT5E1

PAPER TITLE: Major Elective: Nanobiotechnology and Intellectual property rights

PG AND RESEARCH DEPARTMENT OF BIOTECHNOLOGY

NOVEMBER 2019

SECTION – A (One Mark)

Choose the correct answer

UNIT-I

1. The prefix "nano" comes from a
- a) French word meaning billion
 - b) Greek word meaning dwarf
 - c) Spanish word meaning particle
 - d) Latin word meaning invisible

Answer: b) Greek word meaning dwarf

2. Who first used the term nanotechnology and when?
- a) Richard Feynman, 1959
 - b) Norio Taniguchi, 1974
 - c) Eric Drexler, 1986
 - d) Sumio Iijima, 1991

Answer: b) Norio Taniguchi, 1974

3. What is a buckyball?
- a) A carbon molecule (C60)
 - b) Nickname for Mercedes-Benz's futuristic concept car (C111)
 - c) Plastic explosives nanoparticle (C4)
 - d) Concrete nanoparticle with a compressive strength of 20 nanonewtons (C20)

Answer: a) A carbon molecule (C60)

4. Which of these historical works of art contain nanotechnology?
- a) Lycurgus cup
 - b) Medieval stained glass windows in churches
 - c) Damascus steel swords
 - d) All of the above

Answer: d) All of the above

5. What is depicted in this famous image?
- a) Artist's nanoscale illustration of the Circus Maximus in Rome
 - b) Scanning Tunneling Microscope image of electrons surrounded by iron atoms
 - c) Simulation of underwater volcanoes near the Hawaiian Islands
 - d) Nanoscale version of a bear trap to capture nanoparticles

Answer: b) Scanning Tunneling Microscope image of electrons surrounded by iron atoms

6. Richard Feynman is often credited with predicting the potential of nanotechnology. What was the title of his famous speech given on December 29, 1959?

- a) There is a tiny room at the bottom
- b) Things get nanoscopic at the bottom
- c) Bottom? What bottom?
- d) There is plenty of room at the bottom

Answer: d) There is plenty of room at the bottom

7. How many oxygen atoms lined up in a row would fit in a one nanometer space?

- a) None; an oxygen atom is bigger than 1 nm
- b) One
- c) Seven
- d) Seventy

Answer: c) Seven

8. Which one of these statements is NOT true?

- a) Gold at the nanoscale is red
- b) Copper at the nanoscale is transparent
- c) Silicon at the nanoscale is an insulator
- d) Aluminum at the nanoscale is highly combustible

Answer: c) Silicon at the nanoscale is an insulator

9. Which of these consumer products is already being made using nanotechnology methods?

- a) Fishing lure
- b) Golf ball
- c) Sunscreen lotion
- d) All of the above

Answer: d) All of the above

10. If you were to shrink yourself down until you were only a nanometer tall, how thick would a sheet of paper appear to you?

- a) 170 meters
- b) 1.7 kilometers (a bit more than a mile)
- c) 17 kilometers
- d) 170 kilometers

Answer: d) 170 kilometers

11. What is graphene?

- a) A new material made from carbon nanotubes

- b) A one-atom thick sheet of carbon
- c) Thin film made from fullerenes
- d) A software tool to measure and graphically represent nanoparticles

Answer: b) A one-atom thick sheet of carbon

12. Which of these well-known phrases from Star Trek depends on the (fictional) use of nanotechnology?

- a) Beam me up, Scotty!
- b) Tea. Earl Grey. Hot.
- c) You will be assimilated. Resistance is futile.
- d) All of the above

Answer: d) All of the above

13. What is grey goo?

- a) A hypothetical substance composed of out-of-control self-replicating nanobots that consumes all living matter on Earth
- b) The feeder material used to grow grey nanoparticles in the laboratory
- c) Toxic byproduct resulting from the synthesis of carbon nanotubes
- d) Waste product from the production of nanoglue made from the membranes on the feet of the Madagascan Grey Gecko

Answer: a) A hypothetical substance composed of out-of-control self-replicating nanobots that consumes all living matter on Earth

14. Which one of these condiments is unique due to the nanoscale interactions between its ingredients?

- a) Ketchup
- b) Mustard
- c) Mayonnaise
- d) All of the above

Answer: c) Mayonnaise

15. Nanorobots (nanobots)...

- a) Do not exist yet
- b) Exist in experimental form in laboratories
- c) Are already used in nanomedicine to remove plaque from the walls of arteries
- d) Will be used by NASA in the next unmanned mission to Mars

Answer: a) Do not exist yet

16. What is the 2017 budget for the U.S. National Nanotechnology Initiative?

- a) \$587 million
- b) \$917 million
- c) \$1.4 billion
- d) \$2.1 billion

Answer: c) \$1.4 billion

17. Plasmonics is...

- a) A field of nanophotonics that holds the promise of molecular-size optical device technology
- b) The science of fluorescent nanoparticles used in modern fireworks
- c) A hypothetical science used in science fiction weaponry (plasma cannons)
- d) The technology used to design and build the laser-guided photonic gyroscopes used in aviation.

Answer: a) A field of nanophotonics that holds the promise of molecular-size optical device technology

18. Optical tweezers...

- a) Are used to remove facial hair with miniaturized laser beams
- b) Use light to manipulate particles as small as a single atom
- c) Are a nanotechnology-based tool for stamp collectors
- d) Don't exist

Answer: b) Use light to manipulate particles as small as a single atom

19. A silver coin with a diameter of 4 cm (such as the U.S. silver dollar) contains 26.96 grams of coin silver and has a surface area of about 27.7 square cm. If the same 26.96 grams of coin silver were divided into particles 1 nanometer in diameter, what would their combined surface area be?

- a) 11.4 square meters
- b) 140 square meters
- c) 1,400 square meters
- d) 11,400 square meters

Answer: d) 11,400 square meters

20. And what exactly is a quantum dot?

- a) A semiconductor nanostructure that confines the motion of conduction band electrons, valence band holes, or excitons in all three spatial directions.
- b) The sharpest possible tip of an Atomic Force Microscope
- c) A fictional term used in science fiction for the endpoints of wormholes

d) Unexplained spots that appear in electron microscopy images of nanostructures smaller than 1 nanometer

Answer: a) A semiconductor nanostructure that confines the motion of conduction band electrons, valence band holes, or excitons in all three spatial directions.

UNIT-II

21. Which of the following is an example of top-down approach for the preparation of nanomaterials?

- a) Gas phase agglomeration
- b) Molecular self-assembly
- c) Mechanical grinding
- d) Molecular beam epitaxy

Answer: c) Mechanical grinding

22. Which of the following is an example of bottom-up approach for the preparation of nanomaterials?

- a) Etching
- b) Dip pen nano-lithography
- c) Lithography
- d) Erosion

Answer: b) Dip pen nano-lithography

23. The properties like melting point, solubility, color, etc changes on varying the

- a) Size
- b) Composition
- c) Surface properties
- d) None of the mentioned

Answer: a) Size

24. The properties like dispersibility, conductivity, etc changes on varying the

- a) Size
- b) Composition
- c) Surface properties
- d) None of the mentioned

Answer: c) Surface properties

25. Quantum confinement results in

- a) Energy gap in semiconductor is proportional to the inverse of the square root of size
- b) Energy gap in semiconductor is proportional to the inverse of the size

- c) Energy gap in semiconductor is proportional to the square of size
- d) Energy gap in semiconductor is proportional to the inverse of the square of size

Answer: d) Energy gap in semiconductor is proportional to the inverse of the square of size

26. Which of the following is the principal factor which causes the properties of nanomaterials to differ significantly from other materials?

- a) Size distribution
- b) Specific surface feature
- c) Quantum size effects
- d) All the mentioned

Answer: d) All the mentioned

27. Select the incorrect statement from the following options.

- a) Self-assembly is a top-down manufacturing technique?
- b) In self-assembly, weak interactions play very important role
- c) Self-assembling molecules adopt an organised structure which is thermodynamically more stable than the single, unassembled components
- d) Compared to the isolated components, the self-assembled structure has a higher order

Answer: a) Self-assembly is a top-down manufacturing technique

28. Which of the following is the application of nanotechnology to food science and technology?

- a) Agriculture
- b) Food safety and biosecurity
- c) Product development
- d) All of the mentioned

Answer: d) All of the mentioned

29. What are the advantages of nano-composite packages?

- a) Lighter and biodegradable
- b) Enhanced thermal stability, conductivity and mechanical strength
- c) Gas barrier properties
- d) All of the mentioned

Answer: d) All of the mentioned

30. The efficiency of today's best solar cell is about

- a) 15-20%
- b) 40%
- c) 50%
- d) 75%

Answer: b) 40%

31. For high sensitivity or selectivity environmental sensors to sense the gaseous chemical like _

- a) CO₂
- b) NO₃
- c) O₂
- d) NO

Answer: d) NO

32. The synthesized magnetic nano particles from _____ have been found to self-arrange automatically.

- a) Zinc
- b) Copper
- c) Iron
- d) Zirconium

Answer: c) Iron

33. The nano particles from iron and palladium are used to produce _____

- a) Magnets
- b) Magnetic lens
- c) Magneto meters
- d) Magnetic storage devices

Answer: d) Magnetic storage devices

34. Coating the nano crystals with the ceramics is carried that leads to _____

- a) Corrosion
- b) Corrosion resistant
- c) Wear and tear
- d) Soft

Answer: b) Corrosion resistant

35. The _____ to the ceramics are superior coatings.

- a) Nano particles
- b) Nano powder
- c) Nano crystals coating
- d) Nano gel

Answer: c) Nano crystals coating

36. _____ of ceramic components are easier through nano structuring.

- a) Lubrication
- b) Coating
- c) Fabrication
- d) Wear

Answer: c) Fabrication

37. By nano scale distribution of the _____ in matrix improves the life and performance.

- a) Carbide
- b) Tungsten
- c) Hydrides
- d) Nitrites

Answer: b) Tungsten

38. Industrial catalysts should have specific properties such as

- a) High surface area
- b) Low surface area
- c) Moderate surface area
- d) Limited surface area

Answer: a) High

39. The extensively used nano particles as catalyst is

- a) Silver
- b) Copper
- c) Gold
- d) Cerium

Answer: c) Gold

40. Due to _____ tensile strength some of the nano materials are used in air crafts.

- a) High
- b) Low
- c) Moderate
- d) No

Answer: a) High

UNIT - III

41. Which of the following is not a limitation of Beer Lambert's law, which gives the relation between absorption, thickness, and concentration?

- a) Concentration must be lower
- b) Radiation must have higher bandwidth
- c) Radiation source must be monochromatic
- d) Does not consider factors other than thickness and concentration that affect absorbance

Answer: b) Radiation must have higher

bandwidth

42. Beer's law states that the intensity of light decreases with respect to _____

- a) Concentration

- b) Distance
- c) Composition
- d) Volume

Answer: a) Concentration

43. Lambert's law states that the intensity of light decreases with respect to

- a) Concentration
- b) Distance
- c) Composition
- d) Volume

Answer: b) Distance

44. Which of the following is not true about Absorption spectroscopy?

- a) It involves transmission
- b) Scattering is kept minimum
- c) Reflection is kept maximum
- d) Intensity of radiation leaving the substance is an indication of concentration

Answer: c) Reflection is kept maximum

45. Which of the following wavelength ranges is associated with UV spectroscopy?

- a) 0.8 - 500 μ m
- b) 400 - 100nm
- c) 380 - 750nm
- d) 0.01 - 10nm

Answer: b) 400 - 100nm

46. In infrared spectroscopy which frequency range is known as the fingerprint region?

- a) 400 - 1400 cm^{-1}
- b) 1400 - 900 cm^{-1}
- c) 900 - 600 cm^{-1}
- d) 600 - 250 cm^{-1}

Answer: b) 1400 - 900 cm^{-1}

47. In which region of the infrared spectrum would you expect to find a peak characteristic of a triple bond stretch?

- a) 4000 - 3000 cm^{-1}
- b) 2500 - 2000 cm^{-1}
- c) 2000 - 1500 cm^{-1}

d) 1500 - 750cm⁻¹

Answer:b) 2500 - 2000cm⁻¹

48. In a chromatographic separation, which of the following indices is most appropriate for the qualitative identification of a substance?

- a) Relative retention factor R_{rel}
- b) Retention factor R_f
- c) Retention time
- d) Resolution

Answer:b) Retention factor R_f

49. In which region of the electromagnetic spectrum does an absorption at 600 nm come?

- a) Near -UV
- b) Infrared
- c) Vacuum-UV
- d) Visible

Answer: d) Visible

50. In which region of the electromagnetic spectrum does an absorption at 177 nm come?

- a) Near -UV
- b) Visible
- c) Infrared
- d) Vacuum-UV

Answer: d) Vacuum-UV

51. What is a red shift?

- a) The shifting of an absorption towards the blue end of the spectrum
- b) The shifting of an absorption to shorter wavelength.
- c) The shifting of an absorption to lower energy
- d) The shifting of an absorption to higher energy

Answer: c) The shifting of an absorption to lower

energy

52. What is a chromophore?

- a) A group of atoms in a compound responsible for electromagnetic radiation
- b) A coloured compound
- c) A group of atoms in a coloured compound
- d) A group of atoms in a compound responsible for the absorption of electromagnetic radiation

Answer: d) A group of atoms in a compound responsible for the absorption of electromagnetic radiation

53. Molar absorptivities of compounds exhibiting charge transfer absorption are

- a) Small
- b) Moderate
- c) Large
- d) None of these

Answer: c) Large

54. Molar absorptivity is the measure of the

- a) Amount of light absorbed per unit length
- b) Amount of light absorbed per unit concentration
- c) Amount of light reflected and absorbed per unit concentration
- d) None of the above

Answer: b) Amount of light absorbed per unit concentration

55. In the past, IR spectra had to be acquired one wavelength at a time, which took a long time.

Today quick spectra is due to the

- a) The Fourier Transfer Algorithm allows us to scan all frequencies at once
- b) Light is faster today that it used to be
- c) Absence of broad spectrum of wavelength
- d) None of the above

Answer: a) The Fourier Transfer Algorithm allows us to scan all frequencies at once

56. Which of the following is not an IR vibrational mode?

- a) Stretching
- b) Scissoring
- c) Rocking
- d) Rolling

Answer: d) Rolling

57. Nano particles target the rare _____ causing cells and remove them from blood.

- a) Tumour
- b) Fever
- c) Infection
- d) Cold

Answer: a) Tumour

58. _____ is the field in which the nano particles are used with silica coated iron oxide iron oxide.

- a) Magnetic applications
- b) Electronics
- c) Medical diagnosis
- d) Structural and mechanical materials

Answer: c) Medical diagnosis

59. DNA detection through the _____ by using the oligonucleotide functionalized gold nano crystals is developed.

- a) Colorimetric
- b) Diathermy
- c) Electro therapy
- d) Treatment tables

Answer: a) Colorimetric

60. Fabrics are extensively made out of nano materials like _____

- a) Carbon nano tubes
- b) Fullerenes
- c) Mega tubes
- d) Polymers

Answer: b) Fullerenes

UNIT-IV

61. The size of red and white blood cells is in the range of

- a) 2-5 μm
- b) 5-8 μm
- c) 8-11 μm
- d) 12-14 μm

Answer: a) 2-5 μm

62. About how many types of cancer are there?

- a) There are roughly 50 types of cancer.
- b) There are more than 100 types of cancer.
- c) There about 300 types of cancer.
- d) There are more than 1,000 types of cancer.

Answer: b) There are more than 100 types of cancer.

63. Across the globe, _____ is the most common type of cancer that kills men.

- a) Lung cancer
- b) Prostate cancer
- c) Penile cancers
- d) Oral Cancer

Answer: a) Lung cancer

64. Worldwide, _____ is the most common cancer that kills women.

- a) Stomach cancer
- b) Skin cancer
- c) Ovarian cancer
- d) Breast cancer

Answer: d) Breast cancer

65. _____ is the most common form of cancer in all humans.

- a) Brain cancer
- b) Leukemia
- c) Skin cancer
- d) Colon cancer

Answer: c) Skin cancer

66. Which of the viruses below causes cancer resulting from chronic infection?

- a) Herpes simplex viruses (HSV)
- b) Human papilloma virus (HPV)
- c) Hepatitis B Virus (HBV)
- d) Both b and c

Answer: d) Both b and c

67. What kind of foods are linked to colon cancer?

- a) Processed meats
- b) Microwavable foods
- c) Foods with salt substitutes
- d) Shellfish

Answer: a) Processed meats

68. Cancer of the blood cells is referred to as

- a) Kaposi Sarcoma
- b) Basal Cell Carcinoma
- c) Mesothelioma

d) Leukemia

Answer: d) Leukemia

69. **Gold nanoparticles** are emerging as promising agents for

- a) Antibacterial
- b) Antifungal
- c) Antidiabetics
- d) Anticancer

Answer: Anticancer

70. SWCNTs)

- a) single-wall **carbon nanotubes**
- b) signal-wall carbon nanotubes
- c) Most single-walled nanotube
- d) saturable-well carbon nanotubes

Answers: a) single-wall carbon nanotubes

71. 1. _____ poisoning water in Japan is from fishes.

- a) Bismuth
- b) Arsenic
- c) Antimony
- d) Palladium

Answer: b) Arsenic

72. Fishes can store more quantity of _____ in their bodies.

- a) Mercury
- b) Bismuth
- c) Palladium
- d) Chlorine

Answer: a) Mercury

73. Waste water released from _____ are not the sources of bacteria.

- a) Sanitaria
- b) Municipalities
- c) Tanning
- d) Industries

Answer: d) Industries

74. Bacteria and microorganisms present in the water will cause _____ in human and animals.

- a) Indigestion
- b) Intestinal tract
- c) Brain tumour
- d) Cancer

Answer: b) Intestinal tract

75. Infectious hepatitis is caused by _____

- a) Bacteria
- b) Viruses
- c) Protozoa
- d) Helminth

Answer: b) Viruses

76. Helminth in the water causes _____

- a) Hook worm
- b) Amoebic dysentery
- c) Cholera
- d) Typhoid

Answer: a) Hook worm

77. The _____ is an important requirement of the aquatic life.

- a) Dissolved nitrogen
- b) Dissolved chlorine
- c) Dissolved oxygen
- d) Dissolved methane

Answer: c) Dissolved oxygen

78. What is the full form of BOD?

- a) Biochemical oxygen demand
- b) Biological oxygen demand
- c) Biometric oxygen deep water
- d) Biological oxygen deep water

Answer: Biochemical oxygen demand

79. The organic matter present in the water is of _____ types.

- a) Two
- b) Three
- c) Four
- d) Five

Answer: a) Two

80. Which nanomaterials used for drinking water purification commercially?

- a) Silver
- b) Cupper
- c) Zinc
- d) Carbon

Answer: d) Carbon

UNIT-V

81. Intellectual Property Rights (IPR) protect the use of information and ideas that are of

- a) Ethical value
- b) Moral value
- c) Social value
- d) Commercial value

Answer: d) Commercial value

82. The term 'Intellectual Property Rights' covers

- a) Copyrights
- b) Know-how
- c) Trade dress
- d) All of the above

Answer: d) All the above

83. The following can be patented

- a) Machine
- b) Process
- c) Composition of matter
- d) All of the above

Answer: d) All of the above

84. In India, the literary work is protected until

- a) Lifetime of author
- b) 25 years after the death of author
- c) 40 years after the death of author
- d) 60 years after the death of author

Answer: d) 60 years after the death of author

85. Design does not include

- a) Features of shape

- b) Composition of lines or colours
- c) Mode or principle of construction
- d) None of the above

Answer: c) Mode or principle of construction

86. The agreement that is enforceable by law is known as

- a) Valid agreement
- b) Void agreement
- c) Illegal agreement
- d) Unenforceable agreement

Answer: a) Valid agreement

87. Which of the following is (are) included in Geographical indications of Goods

- a) Handicraft
- b) Foodstuff
- c) Manufactured
- d) All of the above

Answer: d) All of the above

88. The term “WIPO” stands for:-

- a) World Investment policy organization
- b) World intellectual property organization
- c) Wildlife Investigation and Policing organization
- d) World institute for Prevention of organized crime

Answer: b) World intellectual property

organization

89. A new way to process milk so that there is no fat in any cheese made from it.

- a) Copy rights
- b) Trade mark
- c) Patent
- d) Industrial designs

Answer: c) Patent

90. A company decides to use a logo that has the same shape as its competitor but with a different color

- a) Copy rights
- b) Trade mark
- c) Patent

d) Industrial designs

Answer: d) Industrial designs

91. The term of copyright for an author lasts how long?

- a) The life of the author
- b) The life of the author plus 60 years
- c) 95 years
- d) 75 years

Answer: c) 95 years

92. Trademark can be used as domain name

- a) Yes
- b) No
- c) Yes in some cases
- d) None of the above

Answer: a) Yes

93. Who administer UDRP?

- a) WTO
- b) WIPO
- c) Supreme Court
- d) High court

Answer: b) WIPO

94. Certification mark can be registered in

- a) Trademark Registry
- b) Certification Board
- c) Quality Control Board
- d) MHRD

Answer: a) Trademark Registry

95. The Copyright Act, 1957 came into effect from

- a) January 1958
- b) April 1958
- c) June 1958
- d) August 1958

Answer: a) January 1958

96. Information Technology Act, 2000 amended in

- a) 2008

- b) 2010
- c) 2012
- d) 2014

Answer: a) 2008

97. Trade Marks Act in India enacted in

- a) 1999**
- b) 2000
- c) 2001
- d) 2002

Answer: a) 1999

98. Indian Design Act enacted in

- a) 2000
- b) 2001
- c) 2002
- d) 2005

Answer: a) 2000

99. The Indian Patents & Design Act enacted in

- a) 1910
- b) 1911
- c) 2002
- d) 2005

Answer: b) 1911

100. World Book and Copyright Day celebrated by UNESCO in

- a) 20th April
- b) 21st April
- c) 22nd April
- d) 23rd April

Answer: d) 23rd April

Section – B

5 Marks

Unit-I

1. What are quantum dots used for?
2. What are quantum dots in nanotechnology?
3. How do quantum dots detect cancer?
4. What is quantum confinement in quantum dots?
5. What is basic difference between quantum dots and nanoparticles?
6. What is structural DNA nanotechnology?
7. What is structural RNA nanotechnology?
8. How can nanotechnology be used to work with DNA?
9. Explain aptamer?
10. What is molecular nanotechnology the future of medicine?

Unit-II

11. How nanoparticles are synthesized?
12. What are the types of nanomaterials?
13. What are the basic approaches used to prepare nanomaterials?
14. What are the properties of nanomaterials?
15. What are nanomaterials give the classification of nanomaterials?
16. Why nanomaterials exhibit different properties explain?
17. Which is the most important property of nanomaterial?
18. Explain chemical synthesis of nanoparticles.
19. Explain PVD.
20. Explain laser pyrolysis.

Unit-III

21. What is use of UV-Vis spectrum in nanoparticles characterization?
22. What is application of FTIR spectrum in nanoparticles characterization?
23. What is application of XRD in nanoparticles characterization?
24. Explain electron microscope.
25. What are the applications of AFM?
26. What are the applications of STM?
27. Give details note of AFM in biological utilization.

28. Give details note on STM in surface analysis.
29. What is EDXS? Give detailed note on composition analysis.
30. Explain microbial nanotechnology

UNIT-IV

31. How is nanotechnology used in medicine?
32. What are the benefits of silver nanoparticles?
33. What is the primary goal of early nanotechnology?
34. What is the difference between bulk materials and nano materials?
35. What is the applications of gold nanoparticles?
36. What is applications of zinc nanoparticles?
37. Explain carbon nanotube in environmental applications
38. Give details account on Phytonanomedicine?
39. Mechanisms of plant extract in nanoparticles preparation.
40. Explain viral nanoparticles.

UNIT-V

41. What is meant by IPR?
42. What is IPR and its importance?
43. What is IPR in biotechnology?
44. What is intellectual property rights PPT?
45. How do I get intellectual property rights in India?
46. What is IPR Act in India?
47. What are the legislation covering IPR in India?
48. What are some examples of intellectual property?
49. What is difference between copyright and patent?
50. What are the five types of intellectual property?

Section- C

8 Marks

UNIT-I

1. Why do nanoparticles have different properties to bulk material?
2. Which is the most important property of nanomaterial?
How the physical and chemical properties of nanoparticles vary with their size?
3. Why nanoparticles are better than microparticles?
4. Explain protein nanotechnology.
5. What are colloidal nanoparticles?
6. What are gold nanoparticles used for?
7. Explain antibody nanotechnology.
8. Do larger nanoparticles absorb shorter or longer wavelengths of light? Explain.
9. Why are gold nanoparticles red surface plasmon theory?
10. Explain peptide nanotechnology in disease management.

UNIT-II

11. What is an example of top down processing?
12. What are the advantages of top down approach?
13. What is difference between top down and bottom up approach?
14. What do you mean by top down approach and bottom up approach of programming?
15. How metal nanoparticles synthesis from plant extract?
16. What is microbial synthesis of nanoparticles?
17. Give details account on virus in nanomaterials synthesis process.
18. Give details note on PVD.
19. What is microemulsion? How nanoparticles are prepared from microemulsion technique.
20. Give details note on electronegative waves in nanoparticles synthesis.

UNIT-III

21. What is an electron microscope and what is it used for?
22. What can be seen with an electron microscope?
23. What are the 3 types of electron microscopes?
24. How does TEM work?
25. How does FESEM work?
26. What is the difference between TEM and SEM?

27. What is AFM analysis?
28. What is STM analysis?
29. What is the difference between STM and AFM?
30. Why SEM is so important in biological research?

UNIT-IV

31. What are the applications of nanomaterials?
32. What is carbon nanoparticles and why is it important in medicine?
33. What products use nanotechnology?
34. How do we use nanotechnology in everyday life?
35. What are some examples of nanoparticles in textile applications?
36. Give details note on antimicrobial mechanisms of silver nanoparticles.
37. What could nanoparticles be used for in the future?
38. Give details note on anticancer mechanisms of gold and gold coated nanoparticles.
39. Give details note on applications of nanoparticles in drinking water treatment.
40. Which nanoparticles are used in cancer treatment?

UNIT-V

41. What are the rights of a patent holder?
42. "Intellectual Property rights have an in-built sunset"- Explain
43. Explain briefly about four important intellectual property rights.
44. What is the procedure for registration of a trademark?
45. What is the method of assigning copyright in a work?
46. When information is called confidential information? What precautions a owner of such information has to take to sustain it as such confidential information?
47. What are the various types of Intellectual Property rights?
48. Explain 'cyberspace' and impact of law.
49. When a trade secret agreement is said to be violated and what are the remedies for it?
50. What is the impact of internet on copyright?

PLANT BIOTECHNOLOGY - 17PBT310 (II M.Sc)

SECTION-A

Choose the correct answer (1 Mark)

UNIT-1

1. Which organelle contains gene for coding large subunit of rubisco protein
(a) **Chloroplast** (b) Nucleus (c) Mitochondria (d) Endoplasmic reticulum
2. Multipartite genome organization was seen in
(a) Chloroplast (b) Nucleus (c) **Mitochondria** (d) Endoplasmic reticulum
3. Number of protein units involved in nucleosome bead formation
(a) 4 (b) 5 (c) 6 (d) **8**
4. Pick out the first generation DNA marker
(a) SCAR (b) SNP (c) **RFLP** (d) AFLP
5. Random primers should have minimum
(a) **40% GC** (b) 45% GC (c) 50% GC (d) 60% GC
6. QTL is used
(a) to investigate number of genes for the trait (b) to find out gene location for the trait
(c) to find the dosage effect of genes for the trait (d) **a, b and c are correct**
7. Microsatellites otherwise called as
(a) **SSR Marker** (b) VNTR Marker (c) SNP Marker (d) All the above
8. Pick out the sequence useful for physical and genetic mapping
(a) **STS** (b) RFLP (c) AFLP (d) SSLP
9. Allelic variation can be detected from
(a) Dominant marker (b) **Co dominant marker** (c) DNA marker (d) Classical marker
10. Pick out the non PCR based marker
(a) RAPD (b) **RFLP** (c) SSLP (d) AFLP
11. QTL is a
(a) Gene independent (b) Single gene (c) Cluster of genes (d) **Both b and c**
12. If A and B genes are tightly linked then their inherited ratio will be
(a) **High** (b) Small (c) Recombination dependent (d) Recombination independent
13. Positional cloning was achieved by requiring
(a) Co segregating marker (b) Cloning vectors (d) **both a and b** (d) None of the above

14. Three types of selection methods was achieved in
(a) **Marker assisted backcrossing** (b) gene pyramiding (c) Marker assisted recurrent selection (d) Genomic selection
15. Marker assisted selection based on marker score is achieved in
(a) Marker assisted backcrossing (b) gene pyramiding (c) **Marker assisted recurrent selection** (d) Genomic selection
16. Marker assisted multiple trait concept was seen in
(a) Marker assisted backcrossing (b) **gene pyramiding** (c) Marker assisted recurrent selection (d) Genomic selection
17. Selective amplification of restricted fragments was achieved by
(a) **AFLP** (b) RFLP (c) RAPD (c) SSLP
18. Single strand polymorphism was detected by
(a) AFLP (b) SNP (c) SSR (c) **SSLP**
19. Semi-autonomous bodies in plant cell are
(a) Nucleus and chloroplast (b) Mitochondria and Nucleus (c) **Mitochondria and Chloroplast** (d) Chloroplast and Golgi complex
20. Rubisco protein coded by
(a) **Nucleus and chloroplast** (b) Mitochondria and Nucleus (c) Mitochondria and Chloroplast (d) Chloroplast and Golgi complex

UNIT-2

21. Plant cells are
(a) Multipotent (b) **Totipotent** (c) Pluripotent (d) Omnipotent
22. Organism genetically identical to its parent is termed as
(a) Chimera (b) Cybrid (c) **Clone** (d) Habituate
23. The cytokinin found in nature
(a) IAA (b) IBA (c) 2,4-d (d) **Zeatin**
24. The explant used for true haploid plant production is
(a) Embryo (b) Seed (c) **Pollen** (d) Shoot tip
25. The main purpose for synthetic seed preparation is
(a) Germination (b) Propagation (c) **Preservation** (d) Cultivation
26. Specific medium designed for callus induction
(a) MS medium (b) **Gamborg medium** (c) Hildebeandt (d) N6 medium

27. The auxin found in nature
(a) **IAA** (b) IBA (c) 2,4-d (d) Zeatin
28. The meristemic region taken as explant for micropropagation
(a) Nodal region (b) Root tip (c) Shoot tip (d) **All the above**
29. Indirect plant regeneration
(a) Shoot tip culture (b) Embryo culture (c) **Callus culture** (d) Root tip culture
30. Pick up the single cell culture technique
(a) Droplet culture (b) Feeder layer technique (c) Hanging droplet culture (d) **Filter paper raft nurse culture**
31. In general, protoplast culture is followed by
(a) Somatic embryogenesis (b) **Somatic hybridization** (c) Cell suspension (d) Plant regeneration
32. Plant used for studying recessive genes
(a) Aneuploid plant (b) **Haploid plant** (c) Diploid plant (d) *In vitro* raised plant
33. Embryo formed from unfertilized egg is called as
(a) Nucellar embryo (b) Androgenetic embryo (c) Adventitive embryo (d) **Parthenogenetic embryo**
34. The order of embryo development stages
(a) **Globular-Heart-Torpedo** (b) Torpedo-Heart-Globular (c) Heart-Torpedo-Globular (d) Heart-Globular-Torpedo
35. Pick out the root inducing hormone
(a) IAA (b) 2,4-d (c) **IBA** (d) NAA
36. TIR1 receptor is used to
(a) **Destruct auxin repressor** (b) transport cytokinin (c) activate nuclear transcriptional factor of cytokinin gene (d) detach shuttle protein
37. Gibberellic acid was isolated from gibberella infected rice plant in crystalline form by
(a) Kurosowa (b) Yabuta and T. Hayashi (c) **Brian, et al** (d) Cross *et al*
38. Pick out the ripening hormone
(a) Abscisic acid (b) Auxin (c) **Ethylene** (d) Gibberellic acid
39. Morphaine alkaloid from *Papaver somniferum* which relieves pain
(a) **Opium** (b) Vincristine (c) Scopolamine (d) Atropine
40. Enhancement of secondary metabolite production through tissue culture technique by
(a) Elicitor (b) Metabolic engineering (c) Hairy root (d) **All the above**

UNIT-3

41. Shuttle vector is comprised of
- (a) Binary & Helper Ti Plasmid (b) **Disarmed Ti Plasmid & Helper Ti Plasmid**
- (c) Binary & Co-integrate Plasmid (d) Co-integrate & Helper Ti Plasmid
42. The most necessary component used for transformation is
- (a) ORI (b) **Vir gene** (c) Gene of interest (d) All the above
43. 16S rRNA of chloroplast genome is sensitive to
- (a) Ampicillin (b) **Streptomycin** (c) Kanamycin (d) Penicillin
44. Pick out the master gene for virulence in Ti plasmid
- (a) **Vir A** (b) Vir B (c) Vir C (d) Vir D
45. Wounded plants which oozes out phenolic compound to heal is
- (a) Kaemferol (b) **Acetosyringone** (c) Quercetin (d) Tannin
46. Single T strand was synthesised by
- (a) **VirD1/VirD2** (b) Vir B (c) Vir E1/E2 (d) Vir G
47. The connection between plant cell and agrobacterium and T-DNA transfer was facilitated by
- (a) VirD1/VirD2 (b) **Vir B** (c) Vir E1/E2 (d) Vir G
48. T-DNA was guided to nuclear pore complex
- (a) **VIP I** (b) VIP II (c) psc A (d) Tra I
49. The single strand binding protein which protects T-strand is coded by
- (a) Vir D1 (b) Vir D2 (c) Vir B (d) **Vir E2**
50. Vir A protein has
- (a) 2 domains (b) **3 domains** (c) 4 domains (d) 5 domains
51. Thin root and nodule formation in hairy root disease was facilitated by
- (a) **Rol B and C** (b) Rol A and B (c) Rol C and D (d) tms1 and tms2
52. Production of auxin in hairy root disease was facilitated by
- (a) Rol B and C (b) Rol A and B (c) Rol C and D (d) **tms1 and tms2**
53. Most widely seen strain in *A. rhizogene* infected plant is
- (a) **Agropine** (b) Mannopine (c) Cucumopine (d) Mikimopine
54. Chloroplast genome is functionally as
- (a) Monocistronic (b) **Polycistronic** (c) Bicistronic (d) Tricistronic

55. Transplastomic plants in which genes have been inserted in
 (a) **Chloroplast** (b) Mitochondria (c) Nucleus (d) Cytosol
56. Selectable marker used in chloroplast transformation is aadA which is resistant to
 (a) Ampicillin (b) **Streptomycin** (c) Ampicillin (d) Penicillin
57. Stronger promoter in chloroplast is
 (a) rrm gene (b) **rrn gene** (c) rrl gene (d) rra gene
58. Gene tagging can be used for
 (a) Detecting site directed mutagenesis (b) Genomic library construction
 (c) Knockout gene (d) **All the above**
59. Ri plasmid has been well studied in
 (a) *A. thaliana* (b) *N. tabacum* (c) ***W. somnifera*** (d) *C. roseus*
60. Gene responsible for auxin production in *A. tumefaciens* is
 (a) **tms** (b) tml (c) tmr (d) tmf

UNIT-4

61. The strong promoter in cauliflower mosaic virus is
 (a) 16S RNA (b) **35S RNA** (c) 19S RNA (d) 5S RNA
62. Pick out the selectable marker gene for transformants selection
 (a) GFP (b) LUC (c) GUS (d) **HPT**
63. The transgenic plant which inhibits EPSP is resistant to
 (a) Virus (b) Insect (c) **Herbicide** (d) Drought
64. The seeds become infertile due to
 (a) **Lethal gene** (b) Recombinase gene (c) Repressible gene (d) All the above
65. 35S RNA has
 (a) 5 ORF (b) 6 ORF (c) **7 ORF** (d) 8 ORF
66. Capsid protein of CaMV is coded by
 (a) II ORF (b) III ORF (c) **IV ORF** (d) V ORF
67. Insect transmission factor coded by
 (a) **II ORF** (b) III ORF (c) IV ORF (d) V ORF
68. The efficiency of transformation increases when the process is carried out in
 conjunction
 (a) **PEG** (b) PVA (c) PVP (d) SDS
69. The detection assay of the enzyme luciferase is based on the principle of
 (a) **Bioluminescence** (b) FACS (c) Flow cytometry (d) All the above

70. The genome of cauliflower mosaic virus is
 (a) **8 Kb** (b) 10 Kb (c) 12 Kb (d) 20 KB
71. A commercially produced particle bombardment apparatus namely _____ is widely used
 (a) **PDS-1000/HC** (b) PTS-1000/HC (c) PDS-100/HS (d) PTS-100/HC
72. _____ is the direct physical method involving the mechanical insertion of the desirable DNA into a target cell
 (a) Electroporation (b) Gene gun (c) Lipofection (d) **Microinjection**
73. The microprojectile bombardment method was first invented by
 (a) Smith (b) **Sanford** (c) Morel (d) Ishiwaki
74. EPSPS gene is used for producing _____ transgenic plant.
 (a) **Herbicide resistance** (b) Drought tolerance (c) Salt tolerance (d) Pest resistance
75. Which among the following is a herbicide cum auxin?
 (a) **Phosphinothricin** (b) 2, 4-D (c) Glyphosate (d) Bavistin
76. The gene responsible for resveratrol synthesis is
 (a) HM1 (b) RP52 (c) **STS** (d) Ct9
77. The gene code for polygalacturonase which is responsible for tomato softening is
 (a) pTOM5 (b) **pTOM6** (c) pTOM12 (d) pTOM13
78. Cry 3 protein is toxic to
 (a) Diptera (b) Lepidoptera (c) **Coleoptera** (d) Lepidoptera and Diptera
79. Causes for gene silencing
 (a) DNA methylation (b) Position effect (c) Histone modification (d) **All the above**
80. Cre enzyme recognize
 (a) **Lox site** (b) FRT (c) RS (d) RP

UNIT-5

81. Glycine betaine is a
 (a) **Osmolyte** (b) Herbicide (c) Fungicide (d) Insecticide
82. The protein which acts as anticoagulant
 (a) Avidin (b) Tricosanthin (c) Phytase (d) **Hirudin**
83. The need of metabolic engineering
 (a) to produce novel compound (b) to produce less specific unwanted compound
 (c) to produce more desired compound (d) **All the above**

84. DREB is essential for
(a) **Cold resistance** (b) Herbicide resistance (c) Drought resistance (d) Insect resistance
85. HVA1 gene is responsible for
(a) Cold resistance (b) Herbicide resistance (c) **Drought resistance** (d) Insect resistance
86. mtID gene is responsible for
(a) Cold resistance (b) Herbicide resistance (c) **Salt tolerance** (d) Insect resistance
87. The gene code for glutathione-s-transferase which shows resistance against NaCl was obtained from
(a) ***Prosopis juliflora*** (b) *Escherichia coli* (c) *Avicenia marina* (d) *Bacillus subtilis*
88. The enzyme is suitable for making plant to be used as cattle feed
(a) Avidin (b) **Phytase** (c) Tricosanthin (d) Hirudin
89. The deficiency of _____ causes Gaucher disease
(a) Vitreoscilla haemoglobin (b) Tricosanthin (c) Avidin (d) **Glucocerebrosidase**
90. The precursor for indole alkaloid biosynthesis pathway is
(a) **Tryptophan** (b) Lysine (c) Tyrosine (d) Ornithine
91. The precursor for tropane alkaloid biosynthesis pathway is
(a) Tryptophan (b) Lysine (c) Tyrosine (d) **Ornithine**
92. The order of biosynthesizing polyhydroxybutyrate is
(a) **Condensation>Reduction>Polymerization**
(b) Reduction>Condensation>Polymerization
(c) Polymerization>Condensation>Reduction
(d) Polymerization>Reduction>Condensation
93. Pha B gene is responsible for _____ in PHB synthesis
(a) Condensation (b) Polymerization (c) **Reduction** (d) Acetylation
94. The advantage of plantigen production
(a) Cost effective (b) Reduce downstream process (c) Edible vaccine (d) **All the above**
95. The plantibody produced by four transgenic tobacco lines through crossing is
(a) IgG (b) **sIgA** (c) IgM (d) IgD
96. The first plantibody produced by transgenic tobacco is
(a) IgG2 (b) IgG4 (c) IgG3 (d) **IgG1**

97. The protein used for purifying our desired recombinant product is
a) Avidin (b) Tricosanthin (c) Phytase (d) **Oleasin**
98. Pelargonidin is responsible for
(a) **Orange colour** (b) Red colour (c) Violet colour (d) Blue colour
99. The transcriptional factor for flavonoid synthesis is
(a) CH1 (b) C1 (b) LC (c) CH1 and LC (d) **LC and C1**
100. The flavonoid which relieves hypertension is
(a) **Ajmalicine** (b) Tabersonine (c) Vincristine (d) Vinblastine

SECTION-B (5 Marks)

UNIT-1

1. Give short note on chloroplast genome organization.
2. Brief account on mitochondrial genome organization
3. Explain about lineage analysis.
4. Write short note on RAPD marker.
5. Give short notes on QTL mapping.
6. What is chromosome walking?
7. Explain about gene pyramiding.
8. Give short note on microsatellites.
9. What is chromosome landing?
10. Brief account on SCAR.

UNIT-2

11. Write short notes on callus induction.
12. Briefly explain the sterilization techniques in a PTC laboratory.
13. Give an account on major types of media
14. Give an account on laboratory organization of plant tissue culture.
15. Write short notes on gibberellic acid biosynthesis.
16. Brief account on synthetic seed preparation
17. Explain the techniques for single cell culture.
18. List out important secondary metabolites with their significances.
19. Explain the way to find out the genetic variation between *invivo* and *in vitro* raised plants.
20. Write short notes on factors influencing micropropagation.

UNIT-3

21. Explain the construction and properties of binary vector.

22. Sort note on co-integrate vector.
23. Describe the mechanical method of gene transfer. List out its merits and demerits.
24. Give short note on electroporation
25. Explain about chemical mediated gene transfer methods.
26. What are opines? Outline the classification of Ti plasmids based on opines.
27. Give an account on the binary vector systems with suitable examples.
28. Short notes on vir genes
29. What is gene tagging?
30. Give short note on advantages of chloroplast transformation.

UNIT-4

31. List out the reporter genes used for selection of transformants.
32. Write short note on CaMV genome with neat diagram.
33. Give short note on lethal gene.
34. Give a brief note on pathogenesis related proteins.
35. Write short note on gene construct.
36. Explain about BT cotton.
37. Write a short note on antisense RNA technology with suitable example.
38. Explain about Gemini virus with a neat diagram.
39. Write a short note on disadvantages of marker genes.
40. Explain about difference between selectable and screenable marker genes.

UNIT-5

41. Explain shortly about the advantages of plantibody.
42. Give short note on influence of abiotic stress in plant growth and development.
43. Give a brief account on cold resistant plant.
44. Write short note on salt and drought resistant genes.
45. List out the advantages of biodegradable plastics.
46. List out some plantigens with their significances.
47. Explain the advantages of plantigens.
48. Give a short note on biosynthesis of indole alkaloid biosynthesis pathway.
49. Write a short note on genes involved in flavonoid biosynthesis.
50. List out some recombinant proteins produced by plant expression system.

SECTION-C (8 Marks)

UNIT-1

1. Describe RFLP in detail.
2. Explain plant nuclear genome organization in detail.
3. Give a brief note on AFLP.
4. Give a detail account on QTL.
5. Explain chloroplast genome organization in detail.
6. Discuss briefly about marker based selection.
7. What is marker and elaborate its role in breeding.
8. Describe briefly about satellites.
9. Give a brief account on PCR based markers.
10. Write a brief note on marker based cloning strategies.

UNIT-2

11. What are growth regulators and give some account on auxins and cytokinins.
12. What is micropropagation and describe the techniques/stages involved in micropropagation with a net sketch.
13. Describe the procedure involved in haploid production.
14. Give a brief account on somatic embryogenesis.
15. Give an account on PTC laboratory organization.
16. Discuss about the types of plant tissue culture medium and add notes on role of medium constituents.
17. Explain protoplast isolation in detail.
18. Give a brief note on callus induction,
19. Explain the strategies involved in secondary metabolite production under *in vitro*.
20. Describe briefly about cell suspension culture.

UNIT-3

21. Describe briefly about indirect gene transfer techniques.
22. What is plasmid and explain both binary and co-integrate vector systems used for transformations.
23. Describe T-DNA transfer mechanism in detail.
24. Explain chloroplast transformation in detail.
25. Describe the organization of Ti plasmid and Ri plasmid.
26. Describe the chemical methods of gene transfer into plant cells with suitable examples.

27. Describe the biolistic method of direct DNA delivery. Highlight its advantages and disadvantages.
28. Explain the application of gene transfer methods in detail.
29. Give a brief account on hairy root disease.
30. Elaborate physical methods of gene transfer.

UNIT-4

31. Give a brief note on Gemini viral vector.
32. Give a detail account on selectable marker with suitable examples.
33. What is a reporter gene? Explain some of them in detail.
34. Describe briefly about endogenous gene silencing mechanism especially in plants.
35. Explain about exogenous SiRNA technology in detail.
36. Give a brief account on marker free transgenics.
37. Give a brief account on terminator technology.
38. Describe BT cotton and flavr savr tomato in detail.
39. Explain briefly about herbicide and insect resistant transgenic plants.
40. Brief note on CaMV viral vector.

UNIT-5

41. Explain salt and drought resistant transgenic plants in detail.
42. Describe plantibody production in detail.
43. Write a brief note on strategies for plantigen production.
44. Give detailed account on PHB production.
45. Describe briefly about alkaloid biosynthesis.
46. Give detail account on role of metabolic engineering in flavonoid biosynthesis.
47. List out some recombinant proteins produced by plant expression system.
48. Write the advantages of plantibody and plantigen.
49. Write a note on genetic engineering strategy to obtain a transgenic plant.
50. Explain cold resistant transgenic plants in detail.

BIOPROCESS TECHNOLOGY

UNIT I

Section – A

1. A fed-batch process is a
 - a) Closed System
 - b) Continuous System
 - c) Intermittently fed System**
 - d) Biphasic System
2. Under steady state conditions specific growth rate is controlled by
 - a) Substrate concentration
 - b) Growth limiting substances
 - c) Dilution rate**
 - d) None of the above
3. Continuous fermentation is used in the production of
 - a) Beer
 - b) Antibiotic
 - c) Vinegar
 - d) Lactic acid**
4. In primary screening microorganisms are capable of producing
 - a) Organic acid
 - b) Amino acid**
 - c) Proteins
 - d) Gases
5. The crowded plate techniques is the simplest screening method that detects and isolates
 - a) Growth factor
 - b) Antibiotic producers**
 - c) growth inhibitors
 - d) stock culture
6. A culture system with constant environment conditions maintained through continual provision of nutrient and removal of wastes is called _____ culture system
 - a) Continuous**
 - b) Batch
 - c) Fed- batch
 - d) Semi continuous
7. Yield coefficient represents
 - a) The total biomass or product produced**
 - b) Conversion efficiency of substrate into product
 - c) Conversion rate of substrate into product or biomass
 - d) Production time of biomass or product
8. Diauxie is
 - a) Growth factors
 - b) Microbiological die off
 - c) Simultaneous takeup of nutrients
 - d) Stage wise uptake of nutrients**
9. The importance of yeast extract in the industrial fermenter is act as
 - a) Vitamins**
 - b) Nitrogen source
 - c) Carbon source
 - d) Carbon and Vitamin source
10. The isolation process should be started in _____ culture using a _____% inoculums
 - a) Batch, 40%
 - b) Continuous, 40%
 - c) Batch, 20%**
 - d) Continuous, 40%
11. _____ is a technique resulting in an increase in the number of a given organism relative to the number of other types in the original inoculums
 - a) Enriched culture
 - b) Entangled culture
 - c) Enhanced culture
 - d) Enrichment culture**
12. The overall production of product improved by
 - a) Genetic modification of microbes
 - b) Changes in medium composition
 - c) Both A and B**
 - d) None of the above
13. Auxotrophic mutant of *C. glutamicum* produce glutamate under the condition of
 - a) Biotin rich**
 - b) Biotin limited
 - c) Optimum level of biotin
 - d) Both a and b
14. The oxygen transfer rate in a bioreactor will increase if
 - a) Oil is used
 - b) Antifoam**
 - c) Detergent like molecules
 - d) Increase reactor temperature
15. Lyophilization is achieved by
 - a) Freezing by -20°C
 - b) Sublimation of cell water**
 - c) Freezing by liquid nitrogen
 - d) Cryoprotective agents
16. _____ cryoprotectant is used before submerging the ampoules for cryopreservation
 - a) Asbestos
 - b) Nutrient agar
 - c) Glycerol
 - d) Liquid nitrogen**
17. In bioprocess yield factor is used to predict the

3. Which part of the fermentor is designed to prevent vortexing
a) Agitator b) Sparger c) Mechanical seal **d) Baffles**
4. What is added to prevent foam formation
a) Glucose **b) Flocculant** c) Silicone d) Coagulant
5. Use of sparger
a) Aeration b) pH c) Temperature d) Purification
6. The fermentor in which the liquid is recirculated by the density differences between the gassed and un-gassed section of the equipment
a) Packed bed b) CSTR **c) Airlift** d) Batch
7. Function of draft tube in an airlift bioreactor
a) To reduce bubble coalescence b) To improve circulation
c) To even out shear condition **d) All of the above**
8. _____ and _____ are the two pleated structures found in the air filters
a) Zig-Zag, Bristle b) Star, Ultri **c) Spear head, long** d) Continuous, batch
9. Another name of tower fermentors
a) CSTR b) Packed bed **c) Airlift** d) Batch
10. What is used to reduce vortexing
a) Impeller **b) Baffles** c) Agitator d) pH
11. Membrane fermentors are used for _____
a) Immobilized cells b) Animal cell culture **c) Waste water treatment** d) All the above
12. Which type of reactor, aeration is generally accomplished in a separate vessel?
a) Fluidised bed b) Trickle bed c) Packed bed **d) Stirred and air-driven reactors**
13. reactor in which a fluid is passed through a granular solid material at high velocity enough velocities to suspend the solid and cause it to behave as though it were a fluid
a) Fluidized bed b) Trickle bed c) Packed bed d) Bubble column
14. Bubble column reactor cannot be used for
a) Highly viscous medium b) Low viscous medium
c) Solid state medium d) Liquid state medium
15. Medium Rheology is
a) Medium flow characteristics b) Air flow characteristics
c) Mass flow characteristics d) Liquid flow characteristics
16. The degree of agitation affects in fermentation process except
a) It increases the contact time for bubbles in the medium
b) It plays a vital role in the oxygen transfer rate in agitated fermenter
c) It influences coalescence of air bubbles
d) It decreases thickness of liquid film at gas-liquid interface
17. In fermenter the top portion left without broth is called
a) Shaft **b) Headspace** c) Impeller d) Sparger
18. Which of the following impellers are used for range of viscosities
a) Paddles b) Turbines **c) Propellers** d) None of these
19. Which of the following is/are non mechanically agitated reactors
a) Stirrer tank b) Bubble c) Airlift reactor **d) both b & c**
20. The range of width for the baffle in the fermenter is _____ times of vessel diameter
a) 1/10 to 1/12 b) 1/8 to 1/10 c) 1/5 to 1/8 **d) none of these**

Key to Section A

1. c	2. a	3. d	4. b	5. a	6. c	7. d	8. c	9. c	10. b
11. c	12. d	13. a	14. a	15. a	16. b	17. b	18. c	19. d	20. d

Section – B

1. Explain about construction materials used for body of fermenter
2. Write a note on different types of impellers
3. Write a Brief notes on airlift bioreactor with neat diagram
4. Write in short about the CSTR
5. How the photo bioreactor system functioning
6. Discuss about packed bed bioreactor
7. Write short note on bioreactors for immobilized cells
8. What is the function of bioreactors
9. Write a short note on design of bioreactors
10. What is the use of pulsed bioreactor

Section – C

1. Explain about basic designing and construction of fermentor
2. What is meant by aseptic operation of fermenter? Explain the categorization of process in microorganism
3. Explain the following reactor with neat diagram
 - i) Stirred tank reactor
 - ii) Airlift fermenters
 - iii) Packed bed
4. What are the use of the following in the bioreactors
 - i) Sampling port
 - ii) Baffles
 - iii) Feed port
 - iv) sensor probes
5. Write a brief notes on batch and CSTR with illustration
6. Give a detailed account on air and components of bioreactors
7. Briefly explain about bioreactors for waste water treatment with illustration
8. Explain about bioreactors for animal cell culture
9. Briefly explain about specialised bioreactors of pulsed, fluidized and photobioreactor
10. Write an brief note on bioreactors for effluent treatment

UNIT III

Section – A

1. Which of the following is an upstream process
 - a) **Media formulation**
 - b) Product recovery
 - c) Product purification
 - d) Cell lysis
2. The micro-organism useful for fermentation are
 - a) Bacteria
 - b) **Yeast**
 - c) Fungi
 - d) None of these
3. Basic principle in industrial microbiology is
 - a) Suitable growth conditions
 - b) Fermentation
 - c) Providing aseptic conditions
 - d) **All of these**
4. Antifoam agent is
 - a) Silicon compounds
 - b) Corn coil
 - c) Soyabean oil
 - d) **All of the above**
5. For the production of ethanol the raw material used is
 - a) Molases
 - b) Cellulose
 - c) **Sulphite waste liquor**
 - d) None of these
6. Carbon sources used in media formulation are following except
 - a) Carbohydrates
 - b) Oils and fats
 - c) Hydrocarbons
 - d) **Peptones**
7. Ammonia, ammonium salts, and urea are the most commonly used sources in the fermentation process.
 - a) Carbon
 - b) Enzyme
 - c) **Nitrogen**
 - d) Minerals
8. Which of the following influence Heat sterilization of media

- a) Number of organisms b) Kind of organisms c) Type of media **d) All of the above**
9. 'Del Factor' is represented as
 a) $\ln N_0/N_t$ **b) $A. e^{-E/RT}$** c) E/RT^2 d) kN
10. Which of the following organism is used as Design organism for sterilization program
 a) *B. amyloaqueficiens* b) *B. anthrax* **c) *B. stearotherompilus*** d) *T. Aquaticus*
11. Continuous sterilization is better over Batch sterilization due to
 a) Protection of nutrient value b) Easier automatic control
 c) Decrease in sterilization time **d) All of the above**
12. Sterilization process in industry is designed for
 a) Only killing all microbes **b) Killing microbes with desired nutrient value**
 c) Sterilization with minimum chance of contamination d) All of the above
13. Which is the best suitable method for sterilization of fermentor and pipe works
 a) Filter Sterilization **b) Heat Sterilization** c) Chemical sterilization d) All of the above
14. Batch sterilization cycle time consists of
 a) **Two phases** b) Three phases
 c) Four phases d) Five phases
15. Which of the following influence heat sterilization of media
 a) Number of organism b) Kind of organism
 c) Type of media **d) All of the above**
16. Indirect heat exchanger stream is injected to
 a) Direct contact with medium **b) Exchanging heating plate**
 c) Both A and B d) None
17. _____ is the process of early cell isolation, cultivation and harvest cells
 a) **Upstream** b) Downstream c) Both a and b d) None of the above
18. Sterilization process by maintaining 140°C for 30-120 seconds
 a) Batch sterilization **b) Continuous sterilization** c) pasteurization d) Autoclave
19. Inertial impaction removes particles more efficiently in
 a) Liquid **b) Air** c) Solid d) All the above
20. Main aim of inoculums preparation
 a) To minimize contamination b) To increase production
c) To decrease lag phase d) All the above

Key to Section A

1. a	2. b	3. d	4. d	5. c	6. d	7. c	8. d	9. b	10. c
11. d	12. b	13. b	14. a	15. d	16. b	17. a	18. b	19. b	20. c

Section – B

1. Give short notes on principles of microbial nutrients
2. Write about one of the major constituent of media formulation
3. How to formulate media?
4. Write in brief about precursors and inhibitors
5. Discuss about Air sterilization
6. Discuss about media optimization for fermentation
7. Detail about the development of inoculums for fermentation
8. How will you maintain aseptic condition in a fermentor
9. Write the advantages of sterilization in batch and continuous process
10. Explain about scale up and scale down process

Section – C

1. Give an overview on upstream processing
2. Explain in brief about media formulation and its essential features
3. Write about various considerations to be followed for media preparation and optimization
4. Explain the batch and continuous sterilization process in details
5. Write in brief about sterilization of a bioreactor and its components
6. Give a detailed account on aseptic operation of fermentor
7. Inocula development in bioprocess technology – explain in detail
8. Briefly explain about air sterilization in fermentation process
9. Explain in detail about design of air filters
10. Discuss about various steps involved in scale up and scale down process

UNIT IV

Section – A

1. Two film theory is model for transport phenomena of between two phases
 - a) Oxygen transfer
 - b) Mass transfer**
 - c) Fluid flow
 - d) All the above
2. What analysis requires human interface
 - a) On-line
 - b) Off-line**
 - c) In-line
 - d) In-situ
3. In which phase of a substance does conduction mode of heat transfer take place?
 - a) solid
 - b) liquid
 - c) gaseous**
 - d) all of the above
4. Mass transfer does not take place in
 - a) conduction heat transfer
 - b) convection heat transfer
 - c) radiation heat transfer
 - d) none of the above**
5. According to the Fourier's law of heat conduction, the rate of heat transfer by conduction depends upon
 - a) Area of cross section normal to the heat flow
 - b) Temperature gradient
 - c) Both a. and b.**
 - d) None of the above
6. Diffusion of components between the phases at equilibrium is
 - a) Zero**
 - b) Infinity
 - c) Changes continuously
 - d) Diffusion never occurs
7. The real driving force of the mass transfer is
 - a) Chemical potential
 - b) Physical potential
 - c) Pressure gradient
 - d) Concentration gradient**
8. Which size of bubbles is relevant for mass transfer?
 - a) Small**
 - b) Very small
 - c) Large
 - d) Very large
9. Which electronic device is used in biosensors?
 - a) Transmitter
 - b) Receptor
 - c) Transducer
 - d) Electrolyte**
10. What is proportional-integral-derivative (PID)?
 - a) Bioreactor
 - b) Controller**
 - c) Mathematical integration
 - d) Mathematical differentiation
11. The monitoring of temperature during fermentation process is carried out by
 - a) pH probe
 - b) Temperature probe**
 - c) Antifoam agent probe
 - d) Exhaust gas probe
12. Which of the following device measure the level of medium in the fermenter?
 - a) Thermometer
 - b) Spectrophotometer
 - c) Galvanometer
 - d) Rotameter**
13. Which of the following measure flow rate of air or liquid during fermentation process?
 - a) Level probe**
 - b) Temperature probe
 - c) Antifoam agent probe
 - d) Exhaust gas probe
14. Which of the following device regulation and control the flow liquids and gases
 - a) Exhaust point
 - b) Exhaust Air filter
 - c) Valves**
 - d) Inlet Air filter
15. What is the Kalman filter?

- a) **Algorithm** b) Computer device c) Filtration equipment d) Constant measurement device
16. Immobilized cells are used in _____ Fermentation
 a) **Packed bed** b) Airlift c) CSTR d) All the above
17. Sensor which do not come with broth or gases is _____
 a) Pressure b) pH c) **Tachometer** d) All the above
18. In polarographic electrode _____ act as nodes
 a) Mercury b) Nickle c) Copper d) **Silver**
19. A digital to analogue convertor converts a digital signal from computer to _____
 a) Visual display b) Sound digital c) membrane signal d) **electrical voltage**
20. Online ion specific sensors have been developed by
 a) Efron b) **Irion** c) Orion d) Emron

Key to Section A

1. b	2. b	3.c	4. d	5. c	6.a	7. d	8. a	9. d	10. b
11. b	12. d	13. a	14. c	15. a	16. a	17. c	18. d	19. d	20. b

Section – B

1. Explain mass transfer in short
2. How is the fermentation process in monitored
3. Give a note on pH monitoring
4. Write in short about online and offline analysis
5. Explain medium rheology
6. Explain about basic steps involved in oxygen transfer into the cells with illustration
7. Explain about agitation and foam level monitoring
8. Explain about pH monitoring in fermentation process
9. Discuss about monitoring probes of temperature
10. Discuss about computer aided control in short

Section – C

1. Write in detail about various transport phenomena in industrial process
2. Explain in brief the rheological properties of fermentation broth
3. Explain about heat and mass transfer mechanism in detail
4. Explain about mass transfer coefficient in detail
5. What are the types of bioprocess monitoring and control
6. Discuss in detail about online and offline analysis
7. Briefly explain about temperature monitoring probes used in fermentation
8. Write an essay on control mechanism applied in fermentation process
9. Briefly explain about PID control
10. Write an essay on computer aided control

UNIT V

Section – A

- Which of the following is a downstream process
a) Screening **b) Product recovery** c) Sterilization of media d) Inoculum preparation
- Cell lysis becomes an important operation if the product is
a) Extra cellular b) Heat labile c) Toxic **d) Intracellular**
- Which of the following factor increase the difficulties of products recovery
a) pH of the medium **b) Cell fragments, soluble and insoluble medium components**
c) Only cell fragments c) d) only insoluble medium components
- Precipitation is done by
a) PEG(polyethylene glycol) b) Triazine dyes
c) Ammonium and sodium sulphate **d) All of the above**
- If the product formed is extracellular then the method which is not used is
a) Reverse osmosis b) Ultra filtration c) Chromatography **d) Freeze thawing**
- Which process uses a porous medium for the separation of the solid material from gas or liquids?
a) Precipitation **b) Filtration** c) Centrifugation d) Foam separation
- Which filter consists of alternately arranged plates and frames where frames are fitted with filter cloth or filter pad?
a) Plate & Frame Filter b) Pressure leaf filter c) Rotary vacuum filter d) Metafilter
- Meta filter is an example of
a) String discharge b) Scraper discharge
c) Scraper discharge with precoating of the drum **d) Stacked leaf filter**
- Which is not an example of Rotary vacuum filter?
a) String discharge b) Scraper discharge
c) Scraper discharge with precoating of the drum **d) Vertical metal-leaf filter**
- Which is an example of Pressure leaf filter?
a) String discharge b) Scraper discharge
c) Scraper discharge with precoating of the drum **d) Vertical metal-leaf filter**
- Plate and frame filter is a type of
a) Batch filtration b) Continuous filtration c) Both of above d) None of above
- Cross flow Filtration consist of:
a) A media storage tank b) A pump c) A system of packs of membrane **d) All of these**
- Which centrifuge contains perforated bowls with a filter bag of nylon or cotton?
a) Basket centrifuge b) Tubular-bowl centrifuge
c) Multi chamber centrifuge **d) Disc-bowl centrifuge**
- Which centrifuge is consists of a central inlet pipe and a system of conical disc, made-up of stainless steel arranged in stacks with a spacer.
a) Basket centrifuge b) Tubular-bowl centrifuge
c) Multi chamber centrifuge **d) Disc-bowl centrifuge**
- Which is the preferred method of clarification of wine?
a) Precipitation b) Chromatography **c) Centrifugation** d) Foam separation
- A measure of the degree of molar polarization of a compound is
a) The dielectric constant b) Electrostatic capacity **C) Partition coefficient** d) None of these
- Which plays a deciding role in the choice of solvents in liquid-liquid extraction process?
a) The dielectric constant D b) Partition coefficient K **c) Both of above** d) None of above
- Name of the enzyme used to disrupt the cell

- a) Ligase **b) Lysozyme** c) Nuclease d) lipase
19. Which process used in penicillin recovery
 a) Activated carbon b) Distillation **c) two phase aqueous system** d) Direct crystalization
20. Other name of freeze drying process
 a) Lyophilization b) Cryodesiccation **c) Both (a) and (b)** d) None

Key to Section A

1. b	2. d	3. b	4. d	5. d	6. b	7. a	8. d	9. d	10. d
11. a	12. d	13. d	14. d	15. c	16. c	17. c	18. b	19. c	20. c

Section – B

1. Write a brief note on downstream processing
2. How microbial cells recovered industrially
3. Write a note on solid matter separation in fermentation process
4. Explain the industrial centrifugation process
5. What are the aids and methods in industrial filtration process
6. Explain microcarrier and excapsulation
7. Explain about filtration practiced in downstream processing
8. How to precipitate protein products
9. Explain about ion exchange chromatography
10. Discuss about product polishing

Section – C

1. Explain in detail about the downstream processing
2. Give a brief account on different methods of cell disruption process.
3. Write in detail about foam separation and precipitation
4. Write in detail about liquid-liquid extraction
5. Briefly explain about distillation methods
6. Write about membrane separation techniques and mention its importance
7. Write in detail about industrial centrifugation techniques
8. Write about the principles of different types of chromatography
2. With a neat diagram explain the gel permeation chromatography
3. Write an essay on product polishing: i) Drying and ii) crystalization

KONGUNADU ARTS AND SCIENCE COLLEGE

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QUESTION BANK



II-M.Sc. Biotechnology (2017-2019 Batch)

SUBJECT CODE: **17PBT3E1**

PAPER TITLE: **Pharmaceutical Biotechnology**

PG AND RESEARCH DEPARTMENT OF BIOTECHNOLOGY

JUNE 2018

SECTION - A

Choose the correct answer (1 Mark)

1. Of the following oral liquid formulations which would be considered as an oropharyngeal formulation?

- a. syrup b. elixir **c. mouthwash** d. linctus

2. Which of the following formulations would not be applicable to ocular administration?

- a. Solution **b. Liniment** c. Suspension d. Ointment

3. A tablet to treat a headache must first be dissolved in water before swallowing. Which one of the following best describes this type of tablet?

- a. Modified release b. Oral disintegration **c. Effervescent** d. Buccal

4. Capsules normally fall into two main categories. Which are they?

- a. Hard gelatin capsules and soft gelatin capsules** b. Hard gelatin capsules and layered capsules c. Soft gelatin capsules and compressed capsules d. Compressed and layered capsules

5. Intravenous, intramuscular and subcutaneous are all examples for which route of administration?

- a. Pulmonary administration **b. Parenteral administration** c. Otic administration
d. Ocular administration

6. Which is the site of administration for the dosage form that uses transdermal delivery?

- a. The eyes b. The lungs c. Under the tongue **d. The skin**

7. Ocular administration involves the treatment of which area?

- a. The skin **b. The eyes** c. The ears d. The lungs

8. Which of the following dosage forms delivers the API to the GI tract?

- a. Rectal suppositories** b. Nasal sprays c. Vaginal pessaries d. Eye drops

9. Name two different types of inhaler?

- a. MDI AND API b. IV AND SC **c. DPI AND MDI** d. GIT AND ATP

10. Nasal administration is commonly used for relief of

- a. Headache b. Cough c. Sore throat **d. Congestion**

11. Which of the following characteristics is detrimental to oral cavity?

a. Stability to digestive enzymes

b. Susceptibility to metabolic enzymes

c. Stability to stomach acids

d. Solubility in both aqueous and fatty environments

12. Which of the following is one of the rules in Lipinski's rule of five?

a. a molecular weight equal to 500

b. no more the five hydrogen bond acceptor groups

c. no more than 10 hydrogen bond donor groups

d. a calculated log P value less than+5

13. Some orally active drugs do not obey the rule of five. For example, some drugs with molecular weight greater than 500 are found to be orally active. Which of following mechanism is the most likely reason for this?

a. transport by transport proteins

b. passage through pores between the cells of the gut wall

c. pinocytosis

d. ion channels

14. Which type of infection could orally treated with highly polar antibacterial agent?

a. brain infection b. Kidney infection **c. gut infection** d. lung infection

15. Which of the following statement if the closest description of phase I metabolism?

a. Reaction which add a polar molecule to a functional group already present on a drug or one of its metabolites

b. Reaction which occur in the blood supply

c. Reaction which add a polar functional group to a drug

d. Reaction which occur in the gut wall

15. Which of the following statement if the closest description of phase II metabolism?

a. Reaction which add a polar molecule to a functional group already present on a drug or one of its metabolites

b. Reaction which occur in the blood supply

c. Reaction which add a polar functional group to a drug

d. Reaction which occur in the gut wall

16. Which of the following groups is least susceptible to cytochrome p450 enzymes?

a. terminal methyl groups b. allylic carbons c. benzylic carbon atoms

d. quaternary carbon atoms

17. Alkenes and aromatic groups can be metabolized to diols. Which enzymes are involved?

a. cytochrome p450 enzymes b. epoxide hydrolase **c. both of the above**

d. none of above

18. Which of the following enzymes is not involved in catalyzing a phase I metabolism?

a. flavin containing monooxygenases b. monoamine oxidases

c. glucuronyltransferase d. esterases

19. Which of the following reaction is not a phase I metabolic transformation?

a. reduction of ketones **b. conjugation to alcohols**

c. oxidation of alkyl groups d. ester hydrolysis

20. Which of the following is statement is not true about cytochrome p450 enzymes?

a. They contain haem and magnesium

b. They belong to general class of enzymes called monooxygenases

c. They are over 30 different cytochrome p450 enzymes

d. Variation in cytochrome p450 enzyme profile between individuals can explain individual variation in drug susceptibility.

21. Which of the following terms is used to describe a drug that has the smallest effect on a receptor as the endogenous chemical messenger?

a. agonist b. antagonist c. partial agonist d. inverse agonist

22. Which of the following terms is used to describe a drug that binds to receptor and activates it but to a lesser extent than the endogenous chemical messenger?

a. agonist b. antagonist **c. partial agonist** d. inverse agonist

23. Which of the following terms is used to describe a drug that binds to receptor, fails to activate it and prevent the endogenous chemical messenger from binding?

a. agonist **b. antagonist** c. partial agonist d. inverse agonist

24. Which of the following terms is used to describe a drug that binds to receptor, fails to activate it and leads to a drop in inherent biological activity?

- a. agonist b. antagonist c. partial agonist **d. inverse agonist**

25. Which of the following is not a crucial requirement for a drug to act as an agonist?

- a. Functional group **b. Metabolic activity** c. Pharmacophore d. Size

26. Which of the following terms applies to the maximum biological effect resulting from a drug binding to its target?

- a. affinity **b. efficacy** c. potency d. stability

27. Which of the following terms is the measure of how strongly a drug binds to a receptor?

- a. affinity** b. efficacy c. potency d. stability

28. Which of the following terms applies to the amount of drug required to produce a defined biological effect?

- a. affinity b. efficacy **c. potency** d. stability

29. An agonist contains an alcohol, amine and aromatic ring, all of which act as binding groups. Which of the following modifications is most likely to result in an antagonist?

- a. Converting the alcohol to methyl ether
- b. Adding an extra aromatic ring to the structure**
- c. Synthesising an analogue which lacks the aromatic ring
- d. Converting the amine to an amide

30. When an agonist binds to a receptor for a long period of time, it can result in a phosphorylation reaction occurring. Which of the following terms is the most relevant description of the immediate effect?

- a. Tolerance b. Dependence c. Sensitization **d. Desensitization**

31. Which of the following statement is true about GPCR?

a. **The N-terminal chain is extracellular and C-terminal chain is intracellular**

b. It contains 5 trans-membrane hydrophobic section

c. There are more extracellular loops than intracellular loops

d. The binding region for G-Protein involves two extracellular loops

32. Which of the following is not a GPCR?

a. **Glycine receptor** b. Adrenergic receptor

c. Glutamate receptor d. Muscarinic receptor

33. Protein kinase A is

a. Completely inhibited by cyclic AMP

b. **Allosterically activated by cyclic AMP**

c. Affected by cyclic AMP only under unusual circumstances

d. Activated by covalent binding of cyclic AMP

34. Which of the following is not involved in signal transduction by B-adrenergic receptor pathway?

a. GTP b. ATP c. **cAMP** d. cGMP

35. Which of the following catalyzes the cutting of PIP 2 into 2 moles of IP 3 and diacylglycerol in cell signaling?

a. Phosphokinase C b. **Phospholipase C** c. Lipokinas d. Phosphodiesterase C

36. The binding of ligands to many GPCRs leads to

a. Decrease in concentration of certain intracellular signal molecules called second messengers

b. Increase in concentration of certain intracellular signal molecules called second messengers

c. Decrease in concentration of certain intracellular signal molecules called first messengers

d. Increase in concentration of certain intracellular signal molecules called first messengers

37. A hormone or ligand can be considered as

a. First messenger b. Second messenger c. Third messenger d. Fourth messenger

38. Which of the following serves as a neurotransmitter in adrenergic neurons?

a. Serotonin **b. Epinephrin** c. Dopamine d. Histamine

39. Which second messenger signals the release of Ca^{2+} from endoplasmic reticulum?

a. IP3 b. 1,2 diacyl glycerol c. cAMP d. cGMP

40. GPCR is comprised of

a. 7 transmembrane helices b. 8 transmembrane helices

c. 9 transmembrane helices d. 10 transmembrane helices

41. The process of introduction of weakened pathogen into human body is called

a. Immunization **b. Vaccination** c. Attenuation d. None of these

42. The first vaccine was developed by

a. Louis Pasteur b. Edward Jenner c. Carl Landsteiner d. Joseph Miester

43. The concept of vaccination was first developed by

- a. Louis Pasteur **b. Edward Jenner** c. Carl Landsteiner d. Joseph Miester

44. The process of weakening a pathogen is called

- a. Vaccination **b. attenuation** c. Immunization d. Virulence reduction

45. The first vaccine developed by Louis Pasteur was against

- a. Pox virus b. Hepatitis virus **c. rabies virus** d. none of these

46. If the dose response curves of a drug for producing different actions are widely separated on the dose axis, the drug is

- a. Highly potent b. Highly efficacious c. Highly toxic **d. Highly selective**

47. The therapeutic index of a drug is a measure of its

- a. Safety** b. Potency c. Efficacy d. Dose viability

48. If the effect of combination of two drugs is equal to the sum of their individual effects the two drugs are exhibiting

- a. Potentiation **b. Synergism** c. Cross tolerance d. Antagonism

49. The antagonism between adrenaline and histamine is called 'physiological antagonism' because

- a. Both are physiologically present in the body
b. They act on physiological receptors
c. Both affect many physiological processes
d. They have opposite physiological effects

50. A drug R producing no response by itself causes the log dose-response curve of another drug S to shift to the right in a parallel manner without decreasing the maximal response: Drug R is a

- a. Partial agonist b. Inverse agonist **c. Competitive agonist** d. Noncompetitive agonist

51. A drug which does not produce any action by itself but decrease the slope of log dose-response curve and suppress the maximal response to another drug is a

- a. Physiological antagonist b. Competitive antagonist **c. Noncompetitive antagonist**
d. Partial agonist

52. A drug which is generally administered in standard doses without the need for dose individualization is

- a. Insulin **b. Mebendazole** c. Prednisolone d. Digoxin

53. Which of the following statements explain receptor affinity?

- a. It is half the dose needed for maximal response
b. It is a measure of how tightly a ligand binds to a receptor
c. It is the maximum response downstream of a receptor
d. It is the concentration of ligand that causes side effects

54. Which receptor does the cardiac glycoside digoxin bind to?

- a. ATP dependent K⁺ channel **b. Na⁺ antiporter**
c. ATP dependent Ca²⁺ channel d. Na⁺/Ca²⁺ antiporter

55. Which of the following is not a type of antagonist?

- a. Reversible competition b. Irreversible competitive
c. Partial competitive d. Non-competitive

56. Why do ACE inhibitors cause cough?

a. ACE breaks down bradykinin

b. ACE causes the accumulation of bradykinin

c. Angiotensin I is a powerful bronchoconstrictor

d. Angiotensin II is a powerful vasoconstrictor

57. When two drugs act on the same receptor the resulting drug interaction is said to be which of the following

a. Predictable

b. Unpredictable

c. Additive

d. Synergistic

58. Why should care be taken when prescribing warfarin and amiodarone in combination?

a. Amiodarone and warfarin both have an anticoagulant effect

b. Amiodarone may reverse the anticoagulant effect of warfarin

c. Amiodarone may increase the anticoagulant effect of warfarin

d. Warfarin may reverse the antiarrhythmic effect of amiodarone

59. The development of drug addiction is caused by which of the following drug/neurotransmitter interaction?

a. The drug increases the release of GABA

b. The drug inhibits the release of GABA

c. The drug increases uptake of dopamine from the synaptic cleft

d. The drug inhibits the release of dopamine into the synaptic cleft

60. When does tachyphylaxis occur?

a. When there is a decreased receptor mediated response to a drug

b. When there is an increased risk of side effects occurring

c. When smaller doses causes an increased response to a drug

d. When the drug causes a faster heart rate

61. Current criteria used in the diagnosis of diabetes mellitus include all of the following symptoms except

a. Fasting hyperglycemia b. Polyuria c. Polydipsia **d. Tinnitus**

62. Patients taking chlorpropamide should avoid products containing

a. Acetaminophen **b. Ethanol** c. Vitamin A d. Penicillin

63. Which of the following may increase the insulin need of diabetes?

a. Isoniazid b. Penicillin c. Glyceryl guaiacolate **d. Aspirin**

64. The insulin receptor is a

a. Ion channel regulating receptor **b. Tyrosine protein kinase receptor**

c. G- Protein coupled receptor d. None of these

65. The antidiabetic agent most likely to cause lactic acidosis

a. Chlorpropamide **b. Phenformin** c. Glipizide d. Metformin

66. In the absence of prophylactic antiretroviral therapy to the mother during pregnancy, labor and delivery and to the fetus following birth, the probability of transmission of HIV from mother to fetus in industrialized countries is?

a. 15-25% b. 25-35% c. 50-60% d. 100%

67. What is the average CD4+ T cell count of an HIV infected patient at the time of death?

a. Just over 200 cells/ microliter **b. Just over 300 cells/ microliter**

c. Just over 400 cells/ microliter d. Just over 100 cells/ microliter

68. Which of the following is believed to a key cause of immortalization of cancer cells in many tumours?

- a. Complete loss of telomeres
- b. Inactivation of the telomerase enzyme
- c. Reactivation of the telomerase enzyme**
- d. Shortening of telomeres

69. Which of the following best defines an oncogenes?

- a. An oncogenes codes for cell cycle control protein
- b. An oncogenes codes for a mutated form of a protein that forms part of signal transduction pathway
- c. An oncogenes codes for a protein that prevents the cell from undergoing apoptosis
- d. An oncogene is a dominantly expressed mutated gene that gives a cell a growth or survival advantage**

70. Which of the following types of protein could be coded by a tumour suppressor gene?

- a. A protein that forms part of a growth factor signaling pathway
- b. A protein that codes for a DNA repair enzyme
- c. A protein that helps prevent apoptosis
- d. A protein that contains progression through the cell cycle**

71. In what way does the ras oncogene contribute to cancer

- a. Ras codes for an anti-apoptotic protein, which is produced in abnormal amounts
- b. Ras codes for GTPase protein, which in its mutated form cancer switched off**
- c. Ras codes for a transcription factor, which is produced in abnormality
- d. Ras codes for a truncated form of growth factor which is called active

72. Which property of p53 enables it to prevent the development of cancer?

a. p53 is a transcription factor that causes production of proteins that stimulate cell cycle

b. p53 prevents the replication of cell with damaged DNA

c. p53 prevents cells from triggering apoptosis

d. p53 stimulates synthesis of DNA repair enzyme that replace telomere sequence lost during cell division

73. Which of the following statement about Rb tumour suppressor protein is correct?

a. Rb is activated when phosphorylated by cdk

b. Rb binds the tf E2F and thus prevents the cell from entering s phase until a mitogenic signal is released

c. Rb is transcription factor

d. When a mitogenic signal is received Rb binds the transcription factor E2F and thus stimulate the cell to enter s phase

74. Which of the following is a characteristic of cancer cell

a. Replicate an unlimited number of times

b. Grows and divides without stimulation of growth factor

c. DNA damage does not halt cell division or stimulate apoptosis

d. Releases factors which cause nearby cells to become cancerous

75. Which of the following is characteristic of malignant rather than benign tumour?

a. Undergoes metastasis

b. Develops a blood supply

c. Cells divide an unlimited number of times d. Grows without needing a growth signal

76. Which of the following can cause mutation which contribute to development of cancer?

a. Chemicals in food **b. UV and ionizing radiation**

c. Reactive oxygen species d. HIV virus

77. Which of the following is the nonconventional route of administration?

a. oral b. nasal **c. rectal** d. ocular

78. Any compound produced by plants is

a. Primary metabolite **b. Plant metabolite**

c. Secondary metabolite d. None of the above

79. Molecules that are found only in certain cells and in certain plants

a. Plant metabolite b. Primary metabolite

c. Secondary metabolite d. None of the above

80. They are often synthesized in one part of the plant and then stored in vacuoles in another part of plant. They are also being discovered almost daily

a. Plant metabolite b. Primary metabolite

c. Secondary metabolite d. None of the above

81. Drugs that can dilate bronchi during an acute asthmatic attack include all of the following except

a. Epinephrine b. Terbutaline **c. Nedocromil** d. Theophylline

82. Which of the following is a nonselective but very potent and efficacious bronchodilator that is not active by the oral route?

a. Aminophylline b. Cromolyn **c. Epinephrine** d. Ipratropium

83. Which of the following is a prophylactic agent that appears to stabilize mast cells?

a. Aminophylline **b. Cromolyn** c. Epinephrine d. Ipratropium

84. Which of the following is a direct bronchodilator that is most often used in asthma by oral route?

- a. **Aminophylline** b. Cromolyn c. Epinephrine d. Ipratropium

85. Acute exacerbations of asthma can be triggered by all of the following except

- a. Bacterial or viral pneumonia b. Hypersensitivity reaction to penicillin
c. Discontinuation of asthma medication **d. Hot, dry weather**

86. In the emergency department the preferred first-line therapy for asthma exacerbation is

- a. Theophylline **b. β -agonist** c. Corticosteroid d. Cromolyn sodium

87. Intranasal spray of budesonide is indicated in

- a. Common cold b. Acute vasomotor rhinitis
c. Perennial vasomotor rhinitis d. Epistaxis

88. Budesonide is a

- a. Nonsteroidal anti-inflammatory drug b. High ceiling diuretic
c. Inhaled corticosteroid for asthma d. Contraceptive

89. Histamine

- a. May be released from mast cells by a number of therapeutic agents
b. Causes sedation
c. Decreases the force of contraction of ventricular muscle
d. Can cause strong contractions of the gravid human uterus

90. Chronic Bronchitis is characterized by

- a. The destruction of central and peripheral portions of the acinus
- b. an increased number of mucous glands and goblet cells
- c. edema and inflammation of bronchioles

d. 1,2 and 3 are correct

91. Smooth muscle relaxation is due to stimulation of which type of histamine receptors

- a. H1
- b. H2**
- c. H3
- d. all the above

92. All the following are employed in inhalation therapy of asthma except

- a. Beclomethasone
- b. Budesonide
- c. Dexamethasone**
- d. Triamcinolone

93. Which xanthine derivative has no function in asthma?

- a. Theophylline
- b. Pentoxifyllin**
- c. Enprofulin
- d. None of the above

94. What is symport?

- a. Counter transport
- b. Contransport**
- c. Carrier mediated diffusion
- d. Solvent drug

95. Pyridostigmine differs from neostigmine in that

- a. More potent orally
- b. Longer acting**
- c. Less muscarinic side effects
- d. All of the above

96. Antitussives act by

- a. Liquifying bronchial secretion
- b. Raising the threshold of cough centre
- c. Reducing cough inducing impulses from the lungs
- d. both b and c**

97. Which of the following antitussive is present in opium but has no analgesic or addicting property?

- a. **Noscapine** b. Codeine c. Pholcodeine d. Ethylmorphine

98. The common and dose related side effect of salbutamol is

- a. Rise in blood pressure **b. Muscle trrmor**
c. Hyperglycaemia d. Central nervous system stimulation

99. Terbutaline has a preference for stimulation of which of the following receptors?

- a. alpha b. gamma c. beta 1 **d. beta 2**

100. Isoxuprine is used to treat

- a. Asthma b. Severe Hypotension
c. Nasal congestion **d. Premature labor**

SECTION – B (5 Marks)

1. Define drug and write note on the sources of drug.
2. Explain about the solid dosage forms of drug.
3. Intravenous drug administration - explain
4. Add note on structural features of drug
5. What is dosage rate? Explain
6. Write about the factors modifying drug absorption?
7. Explain redistribution of drugs
8. Write the mechanism of action of cytochrome p450
9. What is phase I reactions in drug metabolism?
10. Give brief account on phase II metabolism of drug

11. Write about drug receptors in detail
12. Explain the subtypes of drug receptor
13. What is drug receptor interaction?
14. Briefly explain any one model of drug receptor interaction.
15. Write note of GPCR.
16. What is GPCR? Explain the mechanism involved
17. Describe in detail about ion channel linked receptor
18. Give some examples for drug and receptor interaction
19. Write brief notes on drug receptors
20. Agonist- explain
21. What is drug tolerance – explain?
22. Write note on drug dependence.
23. What are the basic principles of pharmacokinetics?
24. Briefly explain the adverse response to drug tolerance
25. Elucidate Pharmacogenetics
26. Explain tachyphylaxis
27. Write a note on drug abuse
28. What is drug action? Write about the factors that modify drug action
29. Describe the assays of drug potency
30. Explain in detail about immunoassay
31. Role of biotechnology in pharmacy – explain

32. Write detailed notes on genetically engineered proteins
33. Elucidate the use of proteins and peptide in drug delivery system
34. Describe non conventional route of administration
35. What are the parts involved in non conventional drug administration
36. Explain in detail about anti AIDS drugs
37. Write brief notes on multidrug resistance
38. Give brief account of production of secondary metabolites
39. Oncogenes acts as target for drugs - How?
40. Explain about the production of any one secondary metabolites that act as drug
41. Give brief note on mechanism of drug action
42. Write in detail about the mechanism of drugs used in therapy of respiration system
43. Brief notes on drug used in therapy of respiration system – cough
44. Brief notes on drug used in therapy of respiration system – Asthma
45. Brief notes on drug used in therapy of respiration system – Tuberculosis
46. What are antimicrobial drugs
47. Elucidate aminoglycosides
48. Write in detail about ovulation inducing drugs
49. Mention about cancer chemotherapy
50. Write in brief about penicillin

SECTION – C (8 Marks)

1. Write in detail about sources and dosage forms of drugs
2. Explain in detail about the different routes of drug administration
3. Give a detailed description on oral drug administration
4. Write about the structural features of drugs
5. Explain in detail about the pharmacological activity of drug isomers
6. Write in detail about prodrugs and their mechanism of activation
7. What is ADME? Write in detail about the overall process
8. Explain absorption of drugs in GI tract
9. Write in brief about the factors modifying drug absorption
10. Write in detail about distribution and redistribution of drugs
11. Explain in detail about the metabolism of drugs in liver
12. Give a detailed overview on excretion of drugs
13. Explain in detail about drug clearance
14. Write in detail about drug receptors and their localization
15. Explain in detail about the types and subtypes of drug receptors
16. Elucidate in detail about the models of drug receptors
17. Write in detail about the theories of drug receptor mechanism
18. Explain in detail about the mechanism and functions of G-protein coupled receptor
19. Write an overview on ion-channel linked receptors and their functions
20. Explain the drug-receptor interactions with examples
21. Write in detail about the agonism and agonists
22. Explain in detail about antagonism and antagonists
23. Drug tolerance and drug intolerance- Explain
24. What is pharmacokinetics? Explain the principles of basic pharmacokinetics
25. What are the adverse effects caused by drugs? Elucidate in detail
26. Explain in detail about dependence of drugs
27. Explain in detail about the steps involved in drug discovery
28. Give a detailed brief about pharmacogenetics
29. Write in detail about the allergic reactions induced by a drug
30. Explain in detail about tachyphylaxis and drug abuse
31. What is vaccination? Write in detail about vaccination against infection
32. Write in detail about the factors that modify drug action and its effects

33. Give a detailed overview on the methods and assays used to test drug potency
34. Explain in detail about the genetically engineered proteins and peptide agents
35. Give an overall brief on different system of drug delivery
36. Write in detail about the non-conventional routes of drug administration
37. Explain in detail about the development of anti-AIDS drugs
38. Explain in detail how oncogenes serve as targets for anti-cancer drugs
39. Write in detail about the concept multidrug resistance
40. Give a detailed account on production of pharmacological secondary metabolites
41. Explain in detail about the mechanism of action of drugs used in cough and bronchial therapy
42. Write in brief about asthma and pulmonary tuberculosis. Write about drugs used in their treatment and their mechanism of action.
43. What are anti-microbial drugs? Explain in detail about aminoglycosides and trimethoprim
44. Explain in detail about penicillin and sulfonamides
45. Give a detailed account on bacterial resistance
46. What is cancer? Write in detail about cancer chemotherapy
47. Write about thyroid gland. Explain in detail about thyroid and anti-thyroid drugs
48. What is diabetes? Give a detailed account on insulin and oral anti-diabetic drugs
49. Write in detail about infertility and antifertility drugs
50. What is ovulation? Explain in detail about ovulation inducing drugs

Question bank

Fundamentals of Biochemistry

Section – A

Choose the correct answer

- Ratio of hydrogen (H) and oxygen (O) in water molecule by volume is
a) **2: 1** b) 1: 2 c) 3: 1 d) 4: 1
- The elements of a water molecule are held together by which type of bond?
a) covalent bond b) double bond c) ionic bond d) hydrogen bond
- Water is a
a) **polar solvent** b) non polar solvent
c) an amphipathic solvent d) non polar uncharged solvent
- Negative logarithm of molar concentration of H⁺ ions in aqueous solutions is called
a) Self-ionization of water b) hydrogenation
c) **pH** d) equilibrium constant
- Attractions between water molecules are called
a) Covalent bonds b) Ionic bonds
c) Polar bonds d) Hydrogen bonds
- Normal pH of blood
a) 7.0 b) 7.2 c) 7.3 **d) 7.4**
- As the pK_a value of an acid increases the acid will be
a) More stronger b) more weaker
c) Converted to neutral solution d) converted to basic solution
- Buffers are mixtures of
a) strong acid and strong base b) strong acid and weak base
c) **weak acid and their conjugate base** d) weak base and their conjugate acid
- The Van der waal's radius of hydrogen atom in water molecule is
a) 1.2Å b) 1.4Å c) 1.6Å d) 1.8Å
- Causes of lactic acidosis include all except
a) Acute Myocardial infarction b) Hypoxia c) Circulatory failure **d) Infections**
- Excessive citrate in transfused blood can cause which of the following abnormalities?
a) **Metabolic alkalosis** b) Metabolic acidosis
c) Respiratory alkalosis d) Respiratory acidosis
- Calculate the pH of a mixture of 0.10M acetic acid and 0.20M sodium acetate. The pK_a of acetic acid is 4.76.
a) **5.1** b) 4.1 c) 6.1 d) 7.1
- In a solution containing phosphate buffer, the pH will be 7.4, if the ratio of monohydrogen phosphate : dihydrogen phosphate is
a) **4 : 1** b) 5 : 1 c) 10 : 1 d) 20 : 1
- Quantitatively, the most significant buffer system in plasma is

31. Which of the following are the storage polysaccharides?
a) Glycogen b) Cellulose c) Chitin d) Glucose
32. Which of the following are the structural polysaccharides?
a) Glycogen b) Starch c) Chitin d) Glucose
33. Which of the following is an analogous to starch?
 a) Cellulose **b) Glycogen** c) Sucrose d) Chitin.
34. Which of the following is not a monosaccharide with 5 carbon atoms?
 a) Arabinose b) Xylulose **c) Trehalose** d) Ribulose
35. Where can you find hyaluronic acid.
 a) synovial fluid of joints b) extracellular matrix of cartilage and tendons
c) vitreous humour of the eye d) around the egg
36. Which of the following are found in connective tissues?
 a) Glycosamineglycans **b) Proteoglycans** c) Gycoproteins d) Glycolipids
37. Which of the following is an oligosaccharide linked to protein?
a) Glycolipid b) Glycoprotein c) Ganglioside d) Galactoside
38. In Kreb's cycle, the hydrogen of malate is accepted by
 a)FMN b)FAD **c) NAD** d) CoA
39. Which of the following ETC components accepts only one electron?
 a) oxygen b) FMN c) FAD **d) cytochrome b.**
40. Coenzyme Q is involved in electron transport as
 a) directly to O₂ b) a water-soluble electron donor
 c) covalently attached cytochrome cofactor **d) a lipid-soluble electron carrier**
41. Which among the following is a non-essential amino acid?
a) Serine b) Threonine c) Lysine d) Histidine
42. Which of the following is an essential amino acid?
 a) Cysteine b) Asparagine c) Glutamine **d) Phenylalanine**
43. Which of the following is an imino acid?
 a) Alanine b) Glycine **c) Proline** d) Serine
44. Which among the following is both glucogenic and ketogenic?
a) Isoleucine b) Leucine c) Lysine d) Histidine
45. Number of chiral centers in isoleucine is
 a) 1 **b) 2** c) 3 d) 4
46. Identify the amino acids containing nonpolar, aliphatic R groups
 a) Phenylalanine, tyrosine, and tryptophan **b) Glycine, alanine, leucine**
 c) Lysine, arginine, histidine d) Serine, threonine, cysteine
47. Peptide bond is a
a) Covalent bond b) Ionic bond c) Metallic bond d) Hydrogen bond

48. A tripeptide has
 a) 3 amino acids and 1 peptide bond **b) 3 amino acids and 2 peptide bonds**
 c) 3 amino acids and 3 peptide bonds d) 3 amino acids and 4 peptide bonds
49. The average molecular weight of an amino acid residue in a protein is about
 a) 128 b) 118 c) **110** d) 120
50. Which of the following is not the classified form of conjugated proteins?
 a) Lipoproteins b) Glycoproteins c) Metalloproteins **d) Complete proteins**
51. Unfolding of a protein can be termed as
 a) Renaturation **b) Denaturation** c) Oxidation d) Reduction
52. What are the following is not a factor responsible for denaturation of proteins?
 a) pH change b) Organic solvents c) Heat **d) Charge**
53. β -pleated sheets are the examples of
 a) Primary structure **b) Secondary structure**
 c) Tertiary structure d) Quaternary structure
54. Which of the following are known as helix breakers?
a) Proline and glycine b) Isoleucine and leucine
 c) Valine d) Threonine
55. Secondary structure is defined by
a) Hydrogen bonding b) Vander Waals forces
 c) Covalent bonding d) Ionic bonding
56. Which of the following forces is favorable for protein folding?
a) Hydrophobic interactions b) Hydrogen bonding
 c) Vander Waals forces d) Ionic bonding
57. Which of the following yield acetyl coA directly?
 a) Phenylalanine **b) Isoleucine**
 c) Lysine d) Alanine
58. Which of the following produce succinyl co-A?
 a) Leucine **b) Isoleucine** c) Arginine d) Alanine
59. Which of the following produce pyruvate?
 a) Leucine b) Isoleucine c) Lysine **d) Alanine**
60. Which of the following produce α -ketoglutarate?
 a) Leucine b) Threonine c) Methionine **d) Proline**
61. Which of the following is an essential fatty acid?
a) Linolenic b) Palmitic c) Oleic d) Stearic
62. Which of the following is a polar derivative of cholesterol?
a) Bile salt b) Oestrogen c) Vitamin D d) Progesterone
63. Which of the following fatty acid has the least melting point?
 a) Palmitic acid b) Stearic acid c) Arachidonic acid **d) Timnodonic acid**

64. Out of the following which is not a source of glycerol?
 a) Adipolysis b) Glycolysis **c) Glycogenolysis** d) Diet.
65. Which of the following fatty acid has 16 carbon atoms?
 a) Linolenic acid b) Oleic acid **c) Palmitic acid** d) Stearic acid
66. Which of the following is a hydroxyl fatty acid?
 a) Linoleic acid b) Palmitic acid c) Linolenic acid **d) Cerebronic acid**
67. Out of the following, which is not an essential amino acid?
 a) Linolic acid b) Linolenic acid **c) Arachidic acid** d) Arachidonic acid.
68. Which of the following is a storage form of lipid?
 a) Glycolipid b) Phospholipid c) Sufolipid **d) Triacyl glycerol.**
69. Which of the following is a sphingophospholipid?
 a) Lecithin **b) Sphingomyelin** c) Plasmolegen d) Cardiolipin
70. Which of the following glycerophospholid acts as a lipotropic agent?
 a) Cardiolipin b) Phosphatidylserine c) Phosphatidylinositol **d) Phosphatidylcholine.**
71. The backbone of phospholipids is
 a) L-glycerol 1-phosphate **b) L-glycerol 3-phosphate**
 c) D-glycerol 3-phosphate d) sn-glycerol 1-phosphate
72. What is the head-group alcohol in plasmolegen and platelet-activating factor?
 a) Alkene **b) Choline** c) Alkane d) Acetic acid
73. Which of the following does not contain glycerol?
 a) Glycerophospholipids b) Galactolipids **c) Sphingolipids** d) Triacylglycerols
74. Biological steroid derived from cholesterol is
 a) Clenbuterol **b) Cortisol** c) Winstrol d) Dianabol.
75. Which of the following reduces double bond, forming saturated acyl ACP?
 a) β -ketoacyl ACP reductase b) β -hydroxyacyl ACP dehydratase
c) Enoyl ACP reductase d) Malonyl co-A ACP transferase.
76. Which of the following carries acyl groups in thio-ester linkage?
a) Acyl carrier protein b) Acetyl co-A ACP transacetylase
 c) Enoyl-ACP reductase d) Malonyl co-A ACP transferase.
77. Identify the purine base of nucleic acids in the following
 a) Cytosine b) Thymine c) Uracil **d) Adenine**
78. Which of the following are not the components of RNA?
a) Thymine b) Adenine c) Guanine d) Cytosine.
79. Group of adjacent nucleotides are joined by
a) Phosphodiester bond b) Peptide bond c) Ionic bond d) Covalent bond.
80. Which ratio is constant for DNA?
 a) $A + G / T + C$ b) $A + T / G + C$
 c) $A + C / U + G$ d) $A + U / G + C$

81. Vitamin A is called

- a) Thiamine **b) Retinol** c) Riboflavin d) Pyridoxin.

82. Ascorbic acid acts as an

- a) **reducing agent** b) oxidizing agent
c) oxidizing and reducing agent d) redox potential.

83. Which one of these vitamins is involved in controlling cell differentiation and proliferation?

- a) **Vitamin A** b) Vitamin B12 c) Vitamin B6 d) Vitamin E

84. Which of these is a symptom of vitamin A deficiency?

- a) osteoporosis b) impaired taste perception
c) **blindness** d) impaired blood clotting

85. Which of these is a vitamin A precursor?

- a) cobalamin b) pyridoxine **c) beta – carotene** d) thiamine

86. Who discovered vitamin C (ascorbic acid)?

- a) Paul Berg b) Linus Pauling **c) Albert Szent-Gyorgyi** d) Kerry Mullis

87. This vitamin deficiency causes bleeding gums and cut not healing.

- a) vitamin C** b) vitamin A c) vitamin D d) vitamin K

88. The molecule which acts directly on an enzyme to lower its catalytic rate is

- a) Repressor **b) Inhibitor** c) Modulator d) Regulator

89. Where does inhibitor binds on enzyme in mixed inhibition?

- a) At active site **b) Allosteric site**
c) Does not bind on enzyme d) Binds on substrate

90. The catalytic efficiency of two distinct enzymes can be compared based on which of the following factor?

- a) K_m b) Product formation
c) Size of the enzymes d) pH of optimum value

91. The polypeptide chains in chymotrypsin are linked by

- a) Hydrogen bonds b) Ionic bonds **c) Disulfide bond** d) SH-SH bond.

92. The allosteric inhibitor of an enzyme

- a) Causes the enzyme to work faster b) Binds to the active site
c) Participates in feedback regulation d) Denatures the enzyme

93. How many types of enzymatic regulation mechanism occurs in the cells?

- a) 2 b) 3 c) 4 **d) 5**

94. Enzymes having slightly different molecular structure but performing identical activity are
- a) holoenzymes b) apoenzymes **c) isoenzymes** d) coenzymes
95. Protein part of the enzyme is often called
- a) conjugated group b) prosthetic group
c) holoenzyme **d) apoenzyme**
96. Enzymes that are involved in control and regulation of biological process are
- a) **allosteric enzymes** b) inhibitors c) regulators d) Activators
97. Nonsubstrate molecules that binds to allosteric sites are called as
- a) inhibitors b) reactants c) allosteric substrate d) **allosteric modulators**
98. A small organic, non protein molecule that carries chemical groups between enzymes
- a) cofactor **b) coenzyme** c) catalyst d) substrate
99. Koshland theory of enzyme action is known as
- a) reduced fit theory b) lock and key theory
c) induced fit theory d) enzyme coenzyme theory
100. A metal cofactor which is used in synthesis of glycolysis is
- a) Fe^{+3} b) Mn^{+2} c) Co^{+2} **d) Mg^{+2}**

Section – B (5 marks)

Answer the following

101. Write a short note on structure of water.
102. Briefly write about the pH scale.
103. Write a short note on Bronsted – Lowry concept of acids and bases.
104. Write a short note on Phosphate buffer system.
105. Briefly discuss on Bicarbonate and Protein buffer system.
106. Write a short note on Covalent bond.
107. Write a short note on coordinate bond.
108. Write a short note on Electrostatic bond.

109. Briefly discuss on Disulphide bond
110. Write a note on Glycosidic bond.
111. Define Carbohydrates and add a note on its classification.
112. Differentiate between reducing and non-reducing sugars.
113. Write a short note on artificial sweeteners.
114. Explain the occurrence and properties of Lactose.
115. Describe the occurrence and properties of Sucrose.
116. Describe TCA cycle.
117. Write a short note on Alcoholic Fermentation.
118. Write a short note on Glyoxylate cycle.
119. Write a short note on ATP Synthetase.
120. Write a short note on electron carriers of the respiratory chain.
121. Classify the Amino acids.
122. Write a short note on the physical properties of Proteins.
123. Write short note on Ramachandran plot.
124. Describe the Structural differences between keratin and collagen
125. Write a short note on cleavage of a protein
126. Write a short note on Chaperonins
127. Write a short note on Deamination and Decarboxylation.
128. Describe the term "Phosgene"
129. Explain the various colour reactions for specific amino acids
130. Explain the term "Ajinomoto".
131. Define Lipid and add a note on alcohols and fatty acids.
132. Explain saturated and unsaturated fatty acids.
133. Comment on oxygenated and cyclic fatty acids.
134. Explain the differences between animal and plant fats.
135. Describe the structure and function of Cholesterol.
136. Write a short note on Fatty acid synthesis.
137. Discuss on the chemical reactions of the fats involving double bond.
138. Define Nucleic acid and add a note on the types and its structural components.
139. Write a short note on the functions of nucleotides.
140. Discuss the Comparison of different forms of DNA.

141. Define Vitamin and also add a note on its general characteristics.
142. Write a short note on the daily human requirements of vitamins.
143. Write a short note on the Wald visual cycle of Vitamin A.
144. Describe the sources of fat soluble vitamins.
145. Write a short note on hypo and hyper manifestation of sodium and potassium.
146. Write a short note on 6 major classes of enzymes.
147. Write a short note on the properties of enzymes.
148. Give a note on Line Weaver Burk plot.
149. Discuss the Enzyme inhibition.
150. Write a short note on the Koshland's Induced Fit Model of active site.

Section – C (8 marks)

Answer the following

151. Explain in detail the physical properties of water.
152. Write an essay on the Cellular reactions of water.
153. Describe in detail the Ionization of water
154. Write an essay on pH of some aqueous fluids and also add a note on how to test pH by
pH meter.
155. Explain in detail about the Buffers of biological systems.
156. Derive Henderson – Hasselbalch equation.
157. Write an essay on Electrovalent bonding.
158. Write an essay on Hydrogen bonding.
159. Write an essay on Vander waal's forces.
160. Explain the role of water in life.
161. Write an essay on the reactions of CHO/CO group.
162. Write an essay on the occurrence, chemistry and properties of Sucrose.
163. Describe in detail the occurrence, chemistry and properties of glycogen and inulin.
164. Explain in detail the occurrence, chemistry and properties of Hyaluronic acid and

Chondroitin sulphate.

165. Describe in detail the blood group substances glycoproteins and peptidoglycans.
166. Explain Glycolysis.
167. Explain in detail the three stages in cell respiration.
168. Explain the Electron Transport chain in Mitochondria.
169. Write an essay on Electron-transport complexes of the Respiratory Chain.
170. Describe in detail the Mechanism of Oxidative Phosphorylation.
171. Describe the Peptide and its classification.
172. Write an essay on the Primary and Secondary structure of Proteins.
173. Write an essay on the Tertiary and quaternary structure of Proteins.
174. Describe in detail the Protein folding.
175. What is the Similarity in 3- 'D' Structure of Hemoglobin and Myoglobin?
176. Write an essay on biological roles of proteins.
177. Write an essay on the Amino acid catabolism
178. Explain in detail the Mechanism of Allosteric Interactions of Hemoglobin.
179. Write an essay on chemical properties of Proteins
180. Explain the Nonstandard protein amino acids and Nonprotein amino acids.
181. Explain in detail the biological roles of lipids.
182. How will you classify lipids based on their chemical composition.
183. Write an essay on Compound lipids.
184. Describe in detail the Derived lipids.
185. Explain in detail the β – oxidation of lipids.
186. Discuss in detail on the Physical properties of Lipids.
187. Write about the quantitative tests to identify the number of hydroxyl groups present in the fat molecule
188. Describe in detail the Double Helical Structure of DNA Watson-Crick Model.
189. Write an essay on Comparison between DNA and RNA.

190. Write an essay on the synthesis and degradation of Pyrimidines.
191. Write an essay on the Physiological functions of Fat soluble Vitamin A.
192. Describe in detail the Hypo and Hyper manifestation of Calcium and Selenium.
193. Explain Ascorbic acid as an antioxidant to neutralize the free radical.
194. Explain the factors affecting enzyme activity.
195. Write an essay on Mechanism of enzyme regulation.
196. Describe with illustration on the reversible and irreversible inhibitors.
197. Write an essay on properties of allosteric enzymes.
198. Write an essay on the Coenzyme NAD.
199. Write an essay of the Allosteric enzymes.
200. Give an account on cofactors.

Skill Based Subject- Human Anatomy and Physiology

UNIT – I

- 1.The tissue type mainly responsible for being a protective layer is
a)Glandular b)connective **c)Epithelium** d)Muscular
2. The tissue type responsible for transporting messages and coordinating the body's response is
a)Muscular **b)Nervous** c)Epithelium d)Glandular
- 3.Muscle tissue is characterized by its
a)Strength b)Ability to endure **c)Ability to contract** d)Rigidity
- 4.Tissue that is thin enough to allow diffusion is
a)Simple cuboidal epithelium **b)Simple squamous epithelium**
c)Areolar connective tissue d)Hyaline cartilage
- 5.Tissue that stores energy ,act as insulation, and protect some organs is
a)Muscle tissue b)nervous tissue **c)Adipose** d)bone
- 6.Tissue that is avascular and as a result is slow to heal is
a)bone **b)Cartilage** c)Epithelium d)Adipose
- 7.Blood is classified as a (n) _ tissue
a)nervous b)epithelial c)muscle **d)connective**
- 8.Contractility is property of _ tissue
a)Muscle b)Nervous c)Epithelial d)Connective
- 9.Conductivity is a property of _ tissue
a)Muscle **b)Nervous** c)Epithelial d)Connective
- 10.Lining layer of Fallopian, Bronchi and Bronchioles consist of
a)Columnar epithelium **b)Ciliated epithelium** c)Cubical epithelium d)
Squamous epithelium

11. Transitional epithelium is found on

- a) Stomach b) Lungs c) Liver **d) Urinary bladder**

12. Goblet cells of intestinal epithelium are examples of

- a) Unicellular glands **b) Columnar epithelium** c) Striated epithelium d) None of these

13. Endothelium blood vessels is made up of

- a) Simple Cuboidal epithelium **b) Simple Squamous epithelium** c) Simple columnar epithelium d) Simple non ciliated columnar epithelium

14. Major protein constituent of muscle fibre is

- a) Actin** b) Tropomyosin c) Myosin d) Calnexin

15. Uninucleate muscles are

- A) Smooth **b) Skeletal** c) Voluntary d) None

16. Unstriped muscles are present in the

- a) Wall of intestine** b) Leg muscles c) Muscles of forelimb d) Heart wall

17. The ability of a muscle to receive and respond to stimulus is referred as

- a) Irritability b) Contractility **c) Extensibility** d) Elasticity

18. Plasma membrane of a muscle cell is known as a

- a) Sarcomembranous b) Endoplasmic reticulum c) Sarcoplasm **d) Sarcolemma**

19. The basic unit of contraction is

- a) Myosin b) Actin c) Z-lines **d) Sarcomeres**

20. Upon stimulation of Skeletal muscles calcium is immediately made available for binding to troponin from

- a) Blood** b) Sarcoplasmic reticulum c) Lymp d) Bone

UNIT-II

1. The basic unit of contraction is the

- a) Myosin b) Actin c) Z lines **d) Sarcomeres**

2. A cord or strap of dense tissue that connects a muscle to bone is called a

- a) Tendon** b) Ligament c) Bursa d) Arthritis

3. The bone placed horizontally at the upper and the anterior part of the thorax above the 1st rib in man is

- a) Scapula b) Cranium **c) Carpals** d) Tibia

5. An example of an irregular bone is

- a) Humerus **b) Vertebrae** c) Scapula d) Patella

6. Which of the following is the structural unit of the nervous system?

- a) Alveoli b) Nephron **c) Neuron** d) Leukocyte

7. Which of the following controls involuntary action

- a) circulatory system **b) Autonomic nervous system** c) Excretory system d) Respiratory system

8. Which of the following coordinates muscular activity

- a) Medulla oblongata **b) Cerebellum** c) Corolla d) Cerebrum

9. Which of the following regulates involuntary actions

- a) Cerebrum b) Cerebellum **c) Medulla oblongata** d) Heart

10. Axons are surrounded by a layer of fatty material called

- a) Myelin sheath** b) Pleura c) Mucus d) Dura

11. Which of the following controls reflex actions

- a) Medulla oblongata b) Spinal cord c) Cerebellum **d) Both a & b**

12. Which of the following brings out the coordination between the organs of the body

- a) Nervous system** b) Excretory system c) Circulatory system d) Respiratory system

13. Malpighian layer of the skin is the part of

- a) Dermis **b) Epidermis** c) Subcutaneous fat d) Hair follicles

14. The skin in man is thickest at

- a) Palm **b) Sole** c) Head d) Thumb

15. In the mammalian skin the adipose tissue is found

- a) In the epidermis b) In the dermis c) In the muscles **d) Below the derm**

16. In the skin collagen and elastic fibres are abundant in the

- a) Subcutaneous layer** b) Epidermis c) Glands d) Stratum corneum

17. Sebaceous glands are found in

- a) Epidermis of skin of mammals **b) Dermis of skin of mammals**
c) Epithelium of stomach of frog d) Epithelium of intestine of frog

18. Hair originates from

- a) Epidermis **b) dermis** c) Subcutaneous layer d) Skin glands

19. The dead cells of epidermis contain a protein called

- a) Rhodopsin b) Melanin c) Incus **d) Carotene**

20. People who have no melanin pigment have white skin and are called

- a) Pigmis b) Mongoloids **c) Albinos** d) Sumerians

UNIT-III

1. The cover of Cartilage that automatically closes when you swallow to act as a protector of the larynx is the

- a) Epiglottis** b) Glottis c) Trachea d) Pharynx

2. Which portion of the respiratory tract is a more common site for aspiration of foreign objects?

- a) Trachea b) Left bronchus **c) Right bronchus** d) Bronchioles

3. The layer of serous membrane that covers the lung tissue is the

- a) Pleural cavity **b) Visceral pleura** c) Parietal pleura d) Respiratory pleura

4. The portion of the brain that controls respiration is the

a)Cerebrum b)Hypothalamus c)Pons **d)Medulla**

5.What is a myocardial infarction?

a)Heart failure **b)Heart attack** c)Cardiac arrest d)all the above

6.The lymph nodes found in the hilum of the lung are the

a)Pulmonary lymph nodes **b)Bronchopulmonary lymph nodes**
c)Tracheobronchial lymph nodes d)Bronchomediastinal lymph nodes

7.Which of the following structure/features are likely to be located at the level of the sterna angle?

a)Right lobar bronchus **b)Left recurrent laryngeal nerve**
c)Left brachiocephalic vein **d)Carinal ridge**

8.The superior, middle and inferior lobes of the right lungs have the following number of bronchopulmonary segments, respectively

a)3,2,5 b)3,3,4 c)2,3,5 d)5,3,2

9. Inflammation of bronchi or bronchioles is called

a)Emphysema **b)Bronchitis** c)Asthma d)Lung cancer

10. Respiratory disorder in which walls of alveoli is destructed is called

a)Asthma **b)emphysema** c)bronchitis d)pneumonia

11. Respiratory disorder in which cells division takes place without any control and causes tumors is called

a)Emphysema **b)lung cancer** c)bronchi cancer d)bronchioles cancer

12.Through which structure does blood pass from the right atrium to the right ventricle?

a) Bicuspid valve b) Interventricular septum **c)Tricuspid valve** d)Mitral valve

13.Which of the below structures prevents blood from flowing back from the lungs?

a)Tricuspid valve b)Bicuspid valve **c)Pulmonary valve** d)Aortic valve

14.In this disorder the aortic valve is narrowed.

- a)Aortic insufficiency b)Rheumatic fever
c)Mitral valve prolapsed **d)Aortic stenosis**

15.This vessel distributes oxygenated blood to the myocardium.

- a)Coronary artery** b)Coronary vein c)Right ventricle d)Left auricle

16.Cardiac muscle fibres electrically connect to neighbouring fibres by

- a)Desmosomes b)Intermediate discs **c)Gap junctions** d)Contractile fibres

17. This is a network of specialised cardiac muscle fibres that provide a path for each cycle of cardiac excitation to progress through the heart.

- a)Pacemaker b)Sinoatrial node c)Purkinje fibres **d)Conduction system**

18.This electrical event triggers contraction of the atria.

- a)R wave b)T wave c)Q wave **d)P wave**

19.This is the layer that protects the heart.

- a)Epicardium** b)Parietal layer c)Myocardial tissue d)Endocardium

20. This is used to reduce the friction between membranes of the heart.

- a) Pericardial cavity b)Endocardium layer c)Pericardium **d)Pericardial (serous) fluid**

UNIT-IV

1.Vili is present in

- a)Heart b)Liver c)Pancreas **d)ileum**

2.The digestive system consists of

- a)alimentary canal b)Two digestive glands c)Lungs **d)Both a&b**

3.Which of the following has no enzymes

- a)Bile** b)Pancreatic juice c)Gastric juice d)All then above

4.Which of the following kills bacteria that enters along the food?

- a)Pepsin **b)Hydrochloric acid** c)Mucin d)Lipase

5.Stomach contains tiny gland called

- a)Gastric gland** b)Pituitary gland c)Thyroid gland d)Slivary gland

6. The stomach opens into

- a) Large intestine **b) Small intestine** c) Colon d) Caecum

7. From the gall bladder bile is released into

- a) Caecum b) Colon c) Ileum **d) Duodenum**

8. Which of the following are called Digestive glands

- a) Liver b) Kidney c) Pancreas **d) Both a & c**

9. Which of the following converts peptons into amino acids?

- a) Trypsin** b) Amylase c) Lipase d) Pepsin

10. The 1st part of the large intestine is called ?

- a) Duodenum b) Ileum c) Colon **d) Caecum**

11. Elimination of nitrogenous wastes is called

- a) Circulation **b) Excretion** c) Digestion d) Respiration

12. Which of the following is the Chief excretory organ?

- a) Kidney** b) Liver c) Pancreas d) Lungs

13. Amount of water filtered by the kidney's per day is

- a) 100 liters b) 110 liters c) 90 liters **d) 170 liters**

14. Outer part of the kidney is called ?

- a) Cortex** b) Pelvis c) Hilus d) Glomerulus

15. Kidney is made up of

- a) Alveoli b) Neuron **c) Nephron** d) Axon

16. Nephron is made up of ?

- a) Renal capsule b) Neuron 3 c) Tubule **d) Both a & c**

17. Bowman's capsule and Glomerulus are together called as?

- a) Malpighian capsule** b) Cerebrum c) Calyx d) Corolla

18. Which of the following has malpighian capsule & Loop of Henry?

a)Nephron b)Neuron c)Stigma d)Liver

19. Which of the following reabsorbs the substance filtered in Bowman's capsule?

a)Axon b)Cyton **c)Tubule** d)Fronnd

20. Kidney act as a filter. Filtration occurs in

a)Ureter b)Cortex **c)Bowman's capsule** d)Neuron

UNIT-V

1. The striated appearance of myofibril is due to the distribution pattern of

a)Actin & Myosin b)Mero Myosin c)Troponin d)Fasciles

2. The globular head of the myosin contains

a)ATPase enzyme b)Calcium ions in large quantities c)ATP d)Troponin

3. Actin binding sites are located on

a)Troponin b)Tropomyosin **c)Meromyosin** d)both Troponin & Tropomyosin

4. Stimulation of a muscle fibre by a motor neuron occur at

a)The neuromuscular junction b)The transverse tubules
c)The myofibril d)Sarcoplasmic reticulum

5. Upon stimulation of Skeletal muscle calcium is immediately made available for binding to troponin from

a)Blood b)Lymp **c)Sarcoplasmic reticulum** d)Bone

6. Endocrine glands have _ to carry their secretions to their specific organ

a)Capillaries b)Tubules c)No ducts **d)Ducts**

7. Which of the following is not an endocrine gland?

a)Liver b)Pancreas c)Testis d)Thymus

8. Gonadotropin releasing hormone is transferred to anterior pituitary by

a)Left coronary artery b)Hypophysical portal veins
c)Axons of neurosecretory cells d)nuclei of hypothalamus

9. GnRH secreted from hypothalamus mainly stimulates the release of

- a) Thyroxin from thyroid gland b) ADH from posterior pituitary
c) **FSH and LH from anterior pituitary** d) Aldosterone from adrenal

10. What is the effect of GnRH produced by hypothalamus?

- a) **Stimulates the synthesis and secretion of androgen**
b) Stimulates secretion of milk in mammary gland
c) Stimulates foetal ejection reflex
d) Stimulates synthesis of carbohydrate from non carbohydrates in liver

11. Antidiuretic hormone is also called as

- a) **Pitressin** b) Sceretin c) Gastrin d) Renin

12. Which is known as master endocrine gland?

- a) Adrenal gland b) thyroid gland c) **pituitary gland** d) pineal gland

13. Which is called as 'Birth hormone'?

- a) Relaxin b) Prolactin c) **Oxytocin** d) Progesterone

14. Grave's disease is caused due to

- a) Hyposecretion of Thyroid gland b) **Hypersecretion of thyroid gland**
c) Hyposecretion of adrenal gland d) Hypersecretion of adrenal gland

15. Which is 32 amino acid water soluble peptide hormone

- a) Gastrin b) **Calcitonin** c) Glucagon d) Insulin

16. The cancer arising in C cells of thyroid is called

- a) papillary cancer b) **Medullary cancer** c) Anaplastic cancer d) Follicular cancer

17. Calcium level decrease in blood due to hyposecretion of

- a) Parathyroid hormone b) **Calcitonin** c) Thyroid d) Adrenalin

18. Which of the following gland is related with immunity?

- a) pineal gland b) adrenal gland c) **thymus** d) parathyroid gland

19. Epinephrine is secreted by

- a) adrenal cortex b) anterior pituitary c) Parathyroid gland d) **Adrenal medulla**

20. Adrenal gland is located over

- a) **Kidney** b) Liver c) Pancreas d) Lungs



BIOINSTRUMENTATION AND BIOPHYSICS- 17UBT303 (II B.Sc)

SECTION-A

Choose the correct answer (1 Mark)

UNIT-1

1. Strong acids are
(a) Slowly gives up H^+ (b) **Readily gives up H^+** (c) Readily accepts H^+
(d) Slowly accepts H^+
2. Smallest distance between two points appears as distinct two points due to
(a) Magnification power (b) Resolving power (c) distinguishing power (d) **Both b & c**
3. What is the basic principle of dialysis membrane?
(a) **Diffusion** (b) Osmosis (c) Adsorption (d) None of the above
4. In centrifuge, centre seeking force is
(a) **Centripetal force** (b) Relative centrifugal force (c) Centrifugal force (d) Both b & c
5. Sorenson's pH scale covers a range of pH from
(a) 0-10 (b) 0-12 (c) **0-14** (d) 0-16
6. Weak electrolytes
(a) Never dissociate (b) **Slightly dissociate** (c) Strongly dissociate (d) Based on solution
7. Zwitter ions are
(a) Positive charge (b) Negative charge (c) **Both positive and negative charge** (d) None of the above
8. Calomel electrode contains
(a) Silver (b) **Mercury** (c) Sodium (d) Phosphorous
9. Glass electrode contains
(a) Mercury (b) Sodium (c) Phosphorous (d) **Silver**
10. Factors affecting pH
(a) Alkaline error (b) Acid error (c) Dehydration of electrode (d) **All the above**
11. The resolving power of the electron microscope is approximately
(a) 0.3nm (b) **0.2nm** (c) 0.4nm (d) 0.5nm

12. A three dimensional appearance of sample is achieved by
(a) Positive staining (b) Negative staining (c) **Metal shadowing** (d) Counter staining
13. The role of projector lens is
(a) To gather scattered electrons (b) To focus electrons on specimen (c) To remove noise (d) **To magnify the primary image**
14. The microscope which run within a cell filled with electrolyte is
(a) TEM (b) **STM** (c) SEM (d) AFM
15. The force move outwards from the center is
(a) Centripetal force (b) Relative centrifugal force (c) **Centrifugal force** (d) Gravitational force
16. Clinical centrifuge is come under
(a) **Small bench** (b) Large capacity (c) High speed (d) Ultracentrifuge
17. Analytical centrifuge is come under
(a) Small bench (b) Large capacity (c) High speed (d) **Ultracentrifuge**
18. Rotors used for low speed centrifugation is made up of
(a) Brass (b) Steel (c) **Aluminium** (d) None of the above
19. 10k membrane will generally retain molecules
(a) **10 kilodaltons** (b) 9 kilodaltons (c) 11 kilodaltons (d) 100 kilodaltons
20. The person who performed first recorded hemodialysis on patients is
(a) Abel (b) Thalhermer (c) **Hass** (d) Wellen Kolff

UNIT-3

21. Volume of mobile phase is called as
(a) Bed volume (b) **Void volume** (c) Effluent (d) Elution
22. What is the principle of column chromatography?
(a) **Adsorption** (b) absorption (c) dissolution (d) diffusion
23. Volume of both solid and liquid in the column is called as
(a) **Bed volume** (b) Void volume (c) Effluent (d) Elution
24. The amount of liquid to produce a peak of particular solute
(a) Bed volume (b) Void volume (c) **Elution** (d) None of the above
25. Factors affecting the efficiency of separation in column chromatography
(a) Dimension of column (b) Particle size of column packing (c) Quality of solvent
(d) **All the above**

26. A single solvent is used in
(a) **Isocratic** (b) Stepwise (c) Gradient (d) Continuous
27. The chromatography works based on charge is
(a) **Ion exchange** (b) Column (c) HPLC (d) GC
28. Pick out the strong anionic exchanger
(a) **Dextran** (b) Polystyrene (c) Cellulosic (d) Acrylic
29. Pick out the strong cationic exchanger
(a) Epoxyamine (b) **Polystyrene** (c) Cellulosic (d) Acrylic
30. The commercial name for polystyrene is
(a) Sephacryl S (b) Sepharose (c) Bio-Gel P (d) **Bio-Beads**
31. The detector used for organic compounds is
(a) **FID** (b) TCD (c) ECD (d) FPD
32. The universal detector used in GC is
(a) FID (b) ECD (c) **TCD** (d) FPD
33. The chromatography used for volatile analysis is
(a) **GC-MS** (b) HPLC (c) HPTLC (d) Column
34. The chromatography used for non-volatile analysis is
(a) GC-MS (b) **HPLC** (c) HPTLC (d) Column
35. In HPLC, the pressure used to deliver solvent up to
(a) 25,000psi (b) **10,000 psi** (c) 15,000psi (d) 20,000psi
36. Maximum volume for sample injection in HPLC is
(a) 200 μ L (b) 250 μ L (c) 400 μ L (d) **500 μ L**
37. Triple point of water is
(a) 4.68 torr (b) 4.20 torr (c) **4.58 torr** (d) 4.48 torr
38. Sublimation is a process from
(a) **Gas to solid** (b) Gas to liquid (c) Solid to liquid (d) Liquid to gas
39. Secondary drying step in lyophilisation is otherwise called as
(a) Sublimation (b) Thermal treatment (c) **Desorption** (d) Backfill and stoppering
40. The order of steps in lyophilisation
(a) **Freeze>Vaccum>Dry** (b) Vaccum>Freeze>Dry (c) Condense>Vaccum>Dry (d)
Vaccum>Condense>Dry

UNIT-4

41. The suitable gel electrophoresis for nucleic acid is
(a) **Agarose** (b) Polyacrylamide (c) 2D-gel (d) Agar
42. In capillary electrophoresis, positive charged molecules
(a) **Moves fast** (b) Moves slow (c) Doesn't move (d) Moves based on force
43. What is the first stage of thermocycler?
(a) Renaturation (b) Annealing (c) **Denaturation** (d) Amplification
44. Quantitative gene expression was analysed by using
(a) Nested PCR (b) **Real time PCR** (c) Inverse PCR (d) Asymmetric PCR
45. _____ is used to overcome unexpected priming
(a) PCR (b) Real time PCR (c) **Nested PCR** (d) Asymmetric PCR
46. _____ is used in sequencing
(a) Nested PCR (b) Real time PCR (c) Inverse PCR (d) **Asymmetric PCR**
47. The PCR which reduces the non-specific priming by varying annealing temperature between the cycles is
(a) Inverse (b) Asymmetric (c) Nested (D) **Touchdown**
48. Restriction and ligation are involved in
(a) **Inverse PCR** (b) Asymmetric PCR (c) Nested PCR (D) Touchdown PCR
49. PCR works readily with DNA of lengths
(a) 3-4kb (b) 4-5kb (c) **2-3kb** (d) 5-6kb
50. Constraints in PCR
(a) Polymerase error (b) Size limitation (c) Non-specific priming (d) **All the above**
51. The most preferred temperature for primer attachment is
(a) **54°C** (b) 72°C (c) 94°C (d) 82°C
52. Scintillation counter is used to measure
(a) α (b) β (c) γ (d) κ
53. In SDS-PAGE, the important chemical used for initiating polymerization is
(a) **APS** (b) SDS (c) Acrylamide (d) Bis-Acrylamide
54. Stacking gel has _____ pore size than separating gel
(a) Small (b) Equal (c) **Large** (d) Relatively small
55. In 2-D gel electrophoresis, first dimension separation is based on
(a) Molecular weight (b) Charge (c) **Isoelectric point** (d) None of the above

56. Protein gets negative charge by
(a) **SDS** (b) TEMED (c) APS (d) β -mercaptoethanol
57. Enrichment of molecules of interest is the goal of
(a) Submarine gel electrophoresis (b) **Preparative electrophoresis** (c) Pulse field gel electrophoresis (d) Field inversion gel electrophoresis
58. Pick out the nucleic acid stain
(a) Silver stain (b) Ethidium bromide (c) Methylene blue (d) **All the above**
59. Electrophoresis works based on electroosmotic flow
(a) Submarine gel electrophoresis (b) Preparative electrophoresis (c) Pulse field gel electrophoresis (d) **Capillary electrophoresis**
60. In 2-D gel electrophoresis, second dimension separation is based on
(a) **Molecular weight** (b) Charge (c) Isoelectric point (d) None of the above

UNIT-5

61. What is the principle of X ray crystallography?
(a) Adsorption (b) Absorption (c) **Diffraction** (d) Reflection
62. Pick out the one dimensional NMR spectroscopy
(a) **Proton** (b) Cosy (c) Hsqc (d) Hmbc
63. X-rays can interact with matter in _____ way
(a) Absorption (b) Scattering (c) Diffraction (d) **All the above**
64. Bragg's law
(a) $\lambda = d \sin \theta$ (b) $2\lambda = d \sin \theta$ (c) $n\lambda = d \sin \theta$ (d) **$n\lambda = 2d \sin \theta$**
65. Structure of DNA was determined by _____ spectroscopy
(a) NMR (b) Raman (c) UV (d) **X-ray**
66. Organic molecules are identified by _____ framework
(a) Carbon (b) Hydrogen (c) Oxygen (d) **Both a and b**
67. Best solvent for proton NMR contains
(a) Proton (b) **No proton** (c) Carbon (d) No carbon
68. A suitable solvent for NMR should
(a) Chemically inert (b) Have no NMR absorption (c) Easily recovered by distillation
(d) **All the above**
69. Magnetic strength can be measured in
(a) Hertz (b) Torr (c) **Tesla** (d) Frequency

70. The applied magnetic field is expressed in NMR as

- (a) \mathbf{B}_0 (B) ΔE (C) $h\nu$ (d) M

SECTION-B (5 Marks)

1. With a neat sketch explain combined electrode of pH meter.
2. Explain the working principle of dialysis membrane.
3. Explain the principle of centrifuge in detail.
4. Write short note on application of electron microscope.
5. Write a short note on pH meter principle.
6. Explain the role of hydrogen ion concentration in biological assays.
7. Draw a neat diagram of transmission electron microscope and explain the components role
8. With a neat sketch explain scanning electron microscope and their components role.
9. Explain shortly about hand centrifuge.
10. Write a short note on rotors.

UNIT-3

11. Short note on principle of thin layer chromatography.
12. Describe shortly about the column characteristics used for chromatography separation.
13. Write a short note on zwitter ions.
14. Explain shortly about the principle of ion exchange chromatography.
15. What is the principle of molecular exclusion chromatography?
16. Explain shortly about the mobile phase of HPLC.
17. Write a short note on mobile phase of gas liquid chromatography.
18. Explain shortly about the principle of mass spectroscopy.
19. Write a short note on condensation, reduction and sublimation.
20. Explain shortly about the application of lyophilisation.

UNIT-4

21. Explain shortly about the principle of AGE.
22. Write the role of SDS in SDS-PAGE
23. Short note on separating gel of SDS-PAGE.
24. Describe shortly about isoelectric focusing.
25. What is the principle of Geiger muller counter?
26. What is the differentiation between solid and liquid scintillation counters?

27. Explain shortly about primer usage in PCR.
28. Short note on primer design.
29. Explain shortly about nested PCR.
30. Write a short note on asymmetric PCR.

UNIT-5

31. What is the principle of X-ray crystallography?
32. Explain shortly about the fundamentals of diffraction.
33. Write a short note on NMR principle.
34. What is the differentiation between first and second dimension NMR spectroscopy?

SECTION-C (8 Marks)

UNIT-1

1. Explain in detail about pH meter.
2. Write an essay on transmission electron microscope.
3. Describe in detail about scanning electron microscope.
4. Write about the principle, instrumentation and working mechanism of centrifuge.
5. Explain about the types of rotors in detail.
6. Describe about the types of centrifuge in detail.
7. Write an essay on the application of centrifuge.
8. Write a brief note on dialysis.

UNIT-3

9. Write an essay on column chromatography.
10. Explain about TLC in detail.
11. Write a brief note on paper chromatography.
12. Describe about ion exchange chromatography in detail.
13. Write an essay on molecular exclusion chromatography.
14. Explain about HPLC in detail.
15. Describe about gas liquid chromatography in detail.
16. Write an essay on mass spectroscopy.
17. Describe about lyophilization stages in detail.

UNIT-4

18. Write an essay on agarose gel electrophoresis.
19. Explain about the role of chemicals used in SDS-PAGE.
20. Describe about immune electrophoresis in detail.
21. Describe about 2-D gel electrophoresis briefly.

22. Explain about capillary electrophoresis in detail.
23. Write an essay on Geiger muller counter.
24. Explain briefly about scintillation counter.
25. Write an essay on principle, working mechanism of PCR.
26. List out the types of PCR and describe in detail.
27. Describe briefly about the application of PCR.

UNIT-5

28. Describe briefly about X-ray crystallography.
29. Discuss about NMR spectroscopy in detail.

31. Which of the following are the storage polysaccharides?
a) Glycogen b) Cellulose c) Chitin d) Glucose
32. Which of the following are the structural polysaccharides?
a) Glycogen b) Starch c) Chitin d) Glucose
33. Which of the following is analogous to starch?
 a) Cellulose **b) Glycogen** c) Sucrose d) Chitin.
34. Which of the following is not a monosaccharide with 5 carbon atoms?
 a) Arabinose b) Xylulose **c) Trehalose** d) Ribulose
35. Where can you find hyaluronic acid.
 a) synovial fluid of joints b) extracellular matrix of cartilage and tendons
c) vitreous humour of the eye d) around the egg
36. Which of the following are found in connective tissues?
 a) Glycosaminoglycans **b) Proteoglycans** c) Glycoproteins d) Glycolipids
37. Which of the following is an oligosaccharide linked to protein?
a) Glycolipid b) Glycoprotein c) Ganglioside d) Galactoside
38. In Krebs's cycle, the hydrogen of malate is accepted by
 a) FMN b) FAD **c) NAD** d) CoA
39. Which of the following ETC components accepts only one electron?
 a) oxygen b) FMN c) FAD **d) cytochrome b.**
40. Coenzyme Q is involved in electron transport as
 a) directly to O₂ b) a water-soluble electron donor
 c) covalently attached cytochrome cofactor **d) a lipid-soluble electron carrier**
41. Which among the following is a non-essential amino acid?
a) Serine b) Threonine c) Lysine d) Histidine
42. Which of the following is an essential amino acid?
 a) Cysteine b) Asparagine c) Glutamine **d) Phenylalanine**
43. Which of the following is an imino acid?
 a) Alanine b) Glycine **c) Proline** d) Serine
44. Which among the following is both glucogenic and ketogenic?
a) Isoleucine b) Leucine c) Lysine d) Histidine
45. Number of chiral centers in isoleucine is
 a) 1 **b) 2** c) 3 d) 4
46. Identify the amino acids containing nonpolar, aliphatic R groups
 a) Phenylalanine, tyrosine, and tryptophan **b) Glycine, alanine, leucine**
 c) Lysine, arginine, histidine d) Serine, threonine, cysteine
47. Peptide bond is a
a) Covalent bond b) Ionic bond c) Metallic bond d) Hydrogen bond

48. A tripeptide has
 a) 3 amino acids and 1 peptide bond **b) 3 amino acids and 2 peptide bonds**
 c) 3 amino acids and 3 peptide bonds d) 3 amino acids and 4 peptide bonds
49. The average molecular weight of an amino acid residue in a protein is about
 a) 128 b) 118 c) **110** d) 120
50. Which of the following is not the classified form of conjugated proteins?
 a) Lipoproteins b) Glycoproteins c) Metalloproteins **d) Complete proteins**
51. Unfolding of a protein can be termed as
 a) Renaturation **b) Denaturation** c) Oxidation d) Reduction
52. What are the following is not a factor responsible for denaturation of proteins?
 a) pH change b) Organic solvents c) Heat **d) Charge**
53. β -pleated sheets are the examples of
 a) Primary structure **b) Secondary structure**
 c) Tertiary structure d) Quaternary structure
54. Which of the following are known as helix breakers?
a) Proline and glycine b) Isoleucine and leucine
 c) Valine d) Threonine
55. Secondary structure is defined by
a) Hydrogen bonding b) Vander Waals forces
 c) Covalent bonding d) Ionic bonding
56. Which of the following forces is favorable for protein folding?
a) Hydrophobic interactions b) Hydrogen bonding
 c) Vander Waals forces d) Ionic bonding
57. Which of the following yield acetyl coA directly?
 a) Phenylalanine **b) Isoleucine**
 c) Lysine d) Alanine
58. Which of the following produce succinyl co-A?
 a) Leucine **b) Isoleucine** c) Arginine d) Alanine
59. Which of the following produce pyruvate?
 a) Leucine b) Isoleucine c) Lysine **d) Alanine**
60. Which of the following produce α -ketoglutarate?
 a) Leucine b) Threonine c) Methionine **d) Proline**
61. Which of the following is an essential fatty acid?
a) Linolenic b) Palmitic c) Oleic d) Stearic
62. Which of the following is a polar derivative of cholesterol?
a) Bile salt b) Oestrogen c) Vitamin D d) Progesterone
63. Which of the following fatty acid has the least melting point?
 a) Palmitic acid b) Stearic acid c) Arachidonic acid **d) Timnodonic acid**

64. Out of the following which is not a source of glycerol?
 a) Adipolysis b) Glycolysis **c) Glycogenolysis** d) Diet.
65. Which of the following fatty acid has 16 carbon atoms?
 a) Linolenic acid b) Oleic acid **c) Palmitic acid** d) Stearic acid
66. Which of the following is a hydroxyl fatty acid?
 a) Linoleic acid b) Palmitic acid c) Linolenic acid **d) Cerebronic acid**
67. Out of the following, which is not an essential amino acid?
 a) Linolic acid b) Linolenic acid **c) Arachidic acid** d) Arachidonic acid.
68. Which of the following is a storage form of lipid?
 a) Glycolipid b) Phospholipid c) Sufolipid **d) Triacyl glycerol.**
69. Which of the following is a sphingophospholipid?
 a) Lecithin **b) Sphingomyelin** c) Plasmolegen d) Cardiolipin
70. Which of the following glycerophospholid acts as a lipotropic agent?
 a) Cardiolipin b) Phosphatidylserine c) Phosphatidylinositol **d) Phosphatidylcholine.**
71. The backbone of phospholipids is
 a) L-glycerol 1-phosphate **b) L-glycerol 3-phosphate**
 c) D-glycerol 3-phosphate d) sn-glycerol 1-phosphate
72. What is the head-group alcohol in plasmolegen and platelet-activating factor?
 a) Alkene **b) Choline** c) Alkane d) Acetic acid
73. Which of the following does not contain glycerol?
 a) Glycerophospholipids b) Galactolipids **c) Sphingolipids** d) Triacylglycerols
74. Biological steroid derived from cholesterol is
 a) Clenbuterol **b) Cortisol** c) Winstrol d) Dianabol.
75. Which of the following reduces double bond, forming saturated acyl ACP?
 a) β -ketoacyl ACP reductase b) β -hydroxyacyl ACP dehydratase
c) Enoyl ACP reductase d) Malonyl co-A ACP transferase.
76. Which of the following carries acyl groups in thio-ester linkage?
a) Acyl carrier protein b) Acetyl co-A ACP transacetylase
 c) Enoyl-ACP reductase d) Malonyl co-A ACP transferase.
77. Identify the purine base of nucleic acids in the following
 a) Cytosine b) Thymine c) Uracil **d) Adenine**
78. Which of the following are not the components of RNA?
a) Thymine b) Adenine c) Guanine d) Cytosine.
79. Group of adjacent nucleotides are joined by
a) Phosphodiester bond b) Peptide bond c) Ionic bond d) Covalent bond.
80. Which ratio is constant for DNA?
 a) $A + G / T + C$ b) $A + T / G + C$
 c) $A + C / U + G$ d) $A + U / G + C$

81. Vitamin A is called

- a) Thiamine **b) Retinol** c) Riboflavin d) Pyridoxin.

82. Ascorbic acid acts as an

- a) **reducing agent** b) oxidizing agent
c) oxidizing and reducing agent d) redox potential.

83. Which one of these vitamins is involved in controlling cell differentiation and proliferation?

- a) **Vitamin A** b) Vitamin B12 c) Vitamin B6 d) Vitamin E

84. Which of these is a symptom of vitamin A deficiency?

- a) osteoporosis b) impaired taste perception
c) **blindness** d) impaired blood clotting

85. Which of these is a vitamin A precursor?

- a) cobalamin b) pyridoxine **c) beta – carotene** d) thiamine

86. Who discovered vitamin C (ascorbic acid)?

- a) Paul Berg b) Linus Pauling **c) Albert Szent-Gyorgyi** d) Kerry Mullis

87. This vitamin deficiency causes bleeding gums and cut not healing.

- a) vitamin C** b) vitamin A c) vitamin D d) vitamin K

88. The molecule which acts directly on an enzyme to lower its catalytic rate is

- a) Repressor **b) Inhibitor** c) Modulator d) Regulator

89. Where does inhibitor binds on enzyme in mixed inhibition?

- a) At active site **b) Allosteric site**
c) Does not bind on enzyme d) Binds on substrate

90. The catalytic efficiency of two distinct enzymes can be compared based on which of the following factor?

- a) K_m b) Product formation
c) Size of the enzymes d) pH of optimum value

91. The polypeptide chains in chymotrypsin are linked by

- a) Hydrogen bonds b) Ionic bonds **c) Disulfide bond** d) SH-SH bond.

92. The allosteric inhibitor of an enzyme

- a) Causes the enzyme to work faster b) Binds to the active site
c) Participates in feedback regulation d) Denatures the enzyme

93. How many types of enzymatic regulation mechanism occurs in the cells?

- a) 2 b) 3 c) 4 **d) 5**

94. Enzymes having slightly different molecular structure but performing identical activity are
- a) holoenzymes b) apoenzymes **c) isoenzymes** d) coenzymes
95. Protein part of the enzyme is often called
- a) conjugated group b) prosthetic group
c) holoenzyme **d) apoenzyme**
96. Enzymes that are involved in control and regulation of biological process are
- a) **allosteric enzymes** b) inhibitors c) regulators d) Activators
97. Nonsubstrate molecules that binds to allosteric sites are called as
- a) inhibitors b) reactants c) allosteric substrate d) **allosteric modulators**
98. A small organic, non protein molecule that carries chemical groups between enzymes
- a) cofactor **b) coenzyme** c) catalyst d) substrate
99. Koshland theory of enzyme action is known as
- a) reduced fit theory b) lock and key theory
c) induced fit theory d) enzyme coenzyme theory
100. A metal cofactor which is used in synthesis of glycolysis is
- a) Fe^{+3} b) Mn^{+2} c) Co^{+2} **d) Mg^{+2}**

Section – B (5 marks)

Answer the following

101. Write a short note on structure of water.
102. Briefly write about the pH scale.
103. Write a short note on Bronsted – Lowry concept of acids and bases.
104. Write a short note on Phosphate buffer system.
105. Briefly discuss on Bicarbonate and Protein buffer system.
106. Write a short note on Covalent bond.
107. Write a short note on coordinate bond.
108. Write a short note on Electrostatic bond.

109. Briefly discuss on Disulphide bond
110. Write a note on Glycosidic bond.
111. Define Carbohydrates and add a note on its classification.
112. Differentiate between reducing and non-reducing sugars.
113. Write a short note on artificial sweeteners.
114. Explain the occurrence and properties of Lactose.
115. Describe the methods for compositional analysis of carbohydrates.
116. Describe TCA cycle.
117. Write a short note on Alcoholic Fermentation.
118. Write a short note on Glyoxylate cycle.
119. Write a short note on ATP Synthetase.
120. Write a short note on electron carriers of the respiratory chain.
121. Classify the Amino acids.
122. Write a short note on the physical properties of Proteins.
123. Write short note on Ramachandran plot.
124. Describe the Structural differences between keratin and collagen
125. Write a short note on cleavage of a protein
126. Write a short note on Chaperonins
127. Write a short note on Deamination and Decarboxylation.
128. Describe the term "Phosgene"
129. Explain the various colour reactions for specific amino acids
130. Explain the term "Ajinomoto".
131. Define Lipid and add a note on alcohols and fatty acids.
132. Explain saturated and unsaturated fatty acids.
133. Comment on oxygenated and cyclic fatty acids.
134. Explain the differences between animal and plant fats.
135. Describe the structure and function of Cholesterol.
136. Write a short note on Fatty acid synthesis.
137. Discuss on the chemical reactions of the fats involving double bond.
138. Define Nucleic acid and add a note on the types and its structural components.
139. Write a short note on the functions of nucleotides.
140. Discuss the Comparison of different forms of DNA.

141. Define Vitamin and also add a note on its general characteristics.
142. Write a short note on the daily human requirements of vitamins.
143. Write a short note on the Wald visual cycle of Vitamin A.
144. Compare the two types of diabetes mellitus.
145. Write a short note on Insulin deficiency.
146. Write a short note on 6 major classes of enzymes.
147. Write a short note on kinetics negative and positive cooperativity.
148. Give a note on the Industrial uses of the enzyme Amylase.
149. Discuss the Industrial uses of the enzyme Protease
150. Write a short note on the Koshland's Induced Fit Model of active site.

Section – C (8 marks)

Answer the following

151. Explain in detail the physical properties of water.
152. Write an essay on the Cellular reactions of water.
153. Describe in detail the Ionization of water
154. Write an essay on pH of some aqueous fluids and also add a note on how to test pH by
pH meter.
155. Explain in detail about the Buffers of biological systems.
156. Derive Henderson – Hasselbalch equation.
157. Write an essay on Electrovalent bonding.
158. Write an essay on Hydrogen bonding.
159. Write an essay on Vander waal's forces.
160. Explain the role of water in life.
161. Write an essay on the reactions of CHO/CO group.
162. Write an essay on the occurrence, chemistry and properties of Sucrose.
163. Describe in detail the occurrence, chemistry and properties of glycogen and inulin.
164. Explain in detail the occurrence, chemistry and properties of Hyaluronic acid and

Chondroitin sulphate.

165. Describe in detail the blood group substances glycoproteins and peptidoglycans.
166. Explain Glycolysis.
167. Explain in detail the three stages in cell respiration.
168. Explain the Electron Transport chain in Mitochondria.
169. Write an essay on Electron-transport complexes of the Respiratory Chain.
170. Describe in detail the Mechanism of Oxidative Phosphorylation.
171. Describe the Peptide and its classification.
172. Write an essay on the Primary and Secondary structure of Proteins.
173. Write an essay on the Tertiary and quaternary structure of Proteins.
174. Describe in detail the Protein folding.
175. What is the Similarity in 3- 'D' Structure of Hemoglobin and Myoglobin?
176. Write an essay on biological roles of proteins.
177. Write an essay on the Amino acid catabolism
178. Explain in detail the Mechanism of Allosteric Interactions of Hemoglobin.
179. Write an essay on chemical properties of Proteins
180. Explain the Nonstandard protein amino acids and Nonprotein amino acids.
181. Explain in detail the biological roles of lipids.
182. How will you classify lipids based on their chemical composition.
183. Write an essay on Compound lipids.
184. Describe in detail the Derived lipids.
185. Explain in detail the β – oxidation of lipids.
186. Discuss in detail on the Physical properties of Lipids.
187. Write about the quantitative tests to identify the number of hydroxyl groups present in the fat molecule
188. Describe in detail the Double Helical Structure of DNA Watson-Crick Model.
189. Write an essay on Comparison between DNA and RNA.

190. Write an essay on the synthesis and degradation of Pyrimidines.
191. Write an essay on the Physiological functions of Fat soluble Vitamin A.
192. Describe in detail the Physiological function of Ascorbic acid.
193. Explain Ascorbic acid as an antioxidant to neutralize the free radical.
194. Explain the biosynthesis, structure and functions of Insulin.
195. Write an essay on Specificity of Enzyme Action.
196. Describe with illustration on the reversible and irreversible inhibitors.
197. Write an essay on Isoenzymes.
198. Write an essay on the Coenzyme NAD.
199. Write an essay of the Allosteric enzymes.
200. Define Active site and add a note on the Fischer's Lock and Key Model.

KONGUNADU ARTS AND SCIENCE COLLEGE

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COIMBATORE – 641 029

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QUESTION BANK



II-B.Sc. Biotechnology (2017-2020 Batch)

SUBJECT CODE: 17UBT303

PAPER TITLE: Bioinstrumentation and Biophysics

PG AND RESEARCH DEPARTMENT OF BIOTECHNOLOGY

APRIL 2019

SECTION-A

Choose the correct answer (1 Mark)

UNIT-1

- Strong acids are
(a) Slowly gives up H^+ (b) **Readily gives up H^+** (c) Readily accepts H^+
(d) Slowly accepts H^+
- Smallest distance between two points appears as distinct two points due to
(a) Magnification power (b) Resolving power (c) distinguishing power (d) **Both b & c**
- What is the basic principle of dialysis membrane?
(a) **Diffusion** (b) Osmosis (c) Adsorption (d) None of the above
- In centrifuge, centre seeking force is
(a) **Centripetal force** (b) Relative centrifugal force (c) Centrifugal force (d) Both b & c
- Sorenson's pH scale covers a range of pH from
(a) 0-10 (b) 0-12 (c) **0-14** (d) 0-16
- Weak electrolytes
(a) Never dissociate (b) **Slightly dissociate** (c) Strongly dissociate (d) Based on solution
- Zwitter ions are
(a) Positive charge (b) Negative charge (c) **Both positive and negative charge** (d) None of the above
- Calomel electrode contains
(a) Silver (b) **Mercury** (c) Sodium (d) Phosphorous
- Glass electrode contains
(a) Mercury (b) Sodium (c) Phosphorous (d) **Silver**
- Factors affecting pH
(a) Alkaline error (b) Acid error (c) Dehydration of electrode (d) **All the above**
- The resolving power of the electron microscope is approximately
(a) 0.3nm (b) **0.2nm** (c) 0.4nm (d) 0.5nm
- A three dimensional appearance of sample is achieved by
(a) Positive staining (b) Negative staining (c) **Metal shadowing** (d) Counter staining

13. The role of projector lens is
(a) To gather scattered electrons (b) To focus electrons on specimen (c) To remove noise (d) **To magnify the primary image**
14. The microscope which run within a cell filled with electrolyte is
(a) TEM (b) **STM** (c) SEM (d) AFM
15. The force move outwards from the center is
(a) Centripetal force (b) Relative centrifugal force (c) **Centrifugal force** (d) Gravitational force
16. Clinical centrifuge is come under
(a) **Small bench** (b) Large capacity (c) High speed (d) Ultracentrifuge
17. Analytical centrifuge is come under
(a) Small bench (b) Large capacity (c) High speed (d) **Ultracentrifuge**
18. Rotors used for low speed centrifugation is made up of
(a) Brass (b) Steel (c) **Aluminium** (d) None of the above
19. 10k membrane will generally retain molecules
(a) **10 kilodaltons** (b) 9 kilodaltons (c) 11 kilodaltons (d) 100 kilodaltons
20. The person who performed first recorded hemodialysis on patients is
(a) Abel (b) Thalhermer (c) **Hass** (d) Wellen Kolff

UNIT-2

21. Beer Lambert's law gives the relation between which of the following?
a) Reflected radiation and concentration
b) Scattered radiation and concentration
c) **Energy absorption and concentration**
d) Energy absorption and reflected radiation
22. Beer's law states that the intensity of light decreases with respect to _____
a) **Concentration**
b) Distance
c) Composition
d) Volume

23. Lambert's law states that the intensity of light decreases with respect to _____
- a) Concentration
 - b) Distance**
 - c) Composition
 - d) Volume
24. What is the unit of absorbance which can be derived from Beer Lambert's law?
- a) $\text{L mol}^{-1} \text{cm}^{-1}$
 - b) $\text{L gm}^{-1} \text{cm}^{-1}$
 - c) Cm
 - d) No unit**
25. What is the unit of molar absorptivity or absorptivity which is used to determine absorbance A in Beer Lambert's formula?
- a) $\text{L mol}^{-1} \text{cm}^{-1}$**
 - b) $\text{L gm}^{-1} \text{cm}^{-1}$
 - c) Cm
 - d) No unit
26. Which of the following is not an application of colorimeter?
- a) Paints
 - b) Inks
 - c) Cosmetics
 - d) Composition detection**
27. In photometers, the readings of the specimen are initially obtained in the form of which of the following parameters?
- a) Transmittance**
 - b) Absorption
 - c) Wavelengths
 - d) Volume
28. Which of the following is a source used in spectroscopy?
- a) LASER
 - b) Tube light
 - c) Sodium vapour lamp
 - d) Tungsten lamp**

29. Laminar flow burner used in Flame photometers is also known as _____
- a) Turbulent burner
 - b) Premix burner**
 - c) Total consumption burner
 - d) Nozzle mix burner
30. Which of the following is not a detector used in Flame emission photometers?
- a) Photronic cell
 - b) Photovoltaic cell
 - c) Photoemissive tube
 - d) Chromatogram**
31. The frequency of ultrasonic wave is
- a) more than 20 kHz**
 - b) less than 20 kHz
 - c) 200 Hz
 - d) 20 Hz to 200 kHz
32. The main advantage of fluorescence over UV-vis spectroscopy is
- a) its sensitivity**
 - b) its compatibility with separation techniques
 - c) that emission spectra give fairly sharp peaks
 - d) its compatibility with most analytes
33. Which of the following wavelength ranges is associated with UV spectroscopy?
- a) 0.8 - 500 μ m
 - b) 400 - 100nm**
 - c) 380 - 750nm
 - d) 0.01 - 10nm
34. Which of the following compounds does not absorb light in the UV/visible spectrum?
- a) Aspirin
 - b) Paracetamol
 - c) Chloral hydrate**
 - d) Phenobarbitone

35. In infrared spectroscopy which frequency range is known as the fingerprint region?
- a) 400 - 1400cm⁻¹
 - b) 1400 - 900cm⁻¹**
 - c) 900 - 600cm⁻¹
 - d) 600 - 250cm⁻¹
36. In which region of the infrared spectrum would you expect to find a peak characteristic of a triple bond stretch?
- a) 4000 - 3000cm⁻¹
 - b) 2500 - 2000cm⁻¹**
 - c) 2000 - 1500cm⁻¹
 - d) 1500 - 750cm⁻¹
37. In a chromatographic separation, which of the following indices is most appropriate for the qualitative identification of a substance?
- a) Relative retention factor R_{rel}**
 - b) Retention factor R_f
 - c) Retention time
 - d) Resolution
38. Which of the following techniques would be most useful to identify and quantify the presence of a known impurity in a drug substance?
- a) NMR
 - b) MS
 - c) IR
 - d) HPLC**
39. Which of the following assays could not be performed by gas chromatography?
- a) Characterisation of volatile oils
 - b) Measurement of drugs and metabolites in biological fluids
 - c) Characterisation of raw materials for drug synthesis
 - d) Analysis of intravenous sodium chloride infusion**
40. Which of the following is not a limitation of Beer Lambert's law, which gives the relation between absorption, thickness and concentration?
- a) Concentration must be lower
 - b) Radiation must have higher bandwidth**
 - c) Radiation source must be monochromatic
 - d) Does not consider factors other than thickness and concentration that affect absorbance

UNIT-3

41. Volume of mobile phase is called as
(a) Bed volume (b) **Void volume** (c) Effluent (d) Elution
42. What is the principle of column chromatography?
(a) **Adsorption** (b) absorption (c) dissolution (d) diffusion
43. Volume of both solid and liquid in the column is called as
(a) **Bed volume** (b) Void volume (c) Effluent (d) Elution
44. The amount of liquid to produce a peak of particular solute
(a) Bed volume (b) Void volume (c) **Elution** (d) None of the above
45. Factors affecting the efficiency of separation in column chromatography
(a) Dimension of column (b) Particle size of column packing (c) Quality of solvent
(d) **All the above**
46. A single solvent is used in
(a) **Isocratic** (b) Stepwise (c) Gradient (d) Continuous
47. The chromatography works based on charge is
(a) **Ion exchange** (b) Column (c) HPLC (d) GC
48. Pick out the strong anionic exchanger
(a) **Dextran** (b) Polystyrene (c) Cellulosic (d) Acrylic
49. Pick out the strong cationic exchanger
(a) Epoxyamine (b) **Polystyrene** (c) Cellulosic (d) Acrylic
50. The commercial name for polystyrene is
(a) Sephacryl S (b) Sepharose (c) Bio-Gel P (d) **Bio-Beads**
51. The detector used for organic compounds is
(a) **FID** (b) TCD (c) ECD (d) FPD
52. The universal detector used in GC is
(a) FID (b) ECD (c) **TCD** (d) FPD
53. The chromatography used for volatile analysis is
(a) **GC-MS** (b) HPLC (c) HPTLC (d) Column
54. The chromatography used for non-volatile analysis is
(a) GC-MS (b) **HPLC** (c) HPTLC (d) Column
55. In HPLC, the pressure used to deliver solvent up to
(a) 25,000psi (b) **10,000 psi** (c) 15,000psi (d) 20,000psi
56. Maximum volume for sample injection in HPLC is

- (a) 200 μ L (b) 250 μ L (c) 400 μ L (d) **500 μ L**
57. Triple point of water is
(a) 4.68 torr (b) 4.20 torr (c) **4.58 torr** (d) 4.48 torr
58. Sublimation is a process from
(a) **Gas to solid** (b) Gas to liquid (c) Solid to liquid (d) Liquid to gas
59. Secondary drying step in lyophilisation is otherwise called as
(a) Sublimation (b) Thermal treatment (c) **Desorption** (d) Backfill and stoppering
60. The order of steps in lyophilisation
(a) **Freeze>Vaccum>Dry** (b) Vaccum>Freeze>Dry (c) Condense>Vaccum>Dry (d)
Vaccum>Condense>Dry

UNIT-4

61. The suitable gel electrophoresis for nucleic acid is
(a) **Agarose** (b) Polyacrylamide (c) 2D-gel (d) Agar
62. In capillary electrophoresis, positive charged molecules
(a) **Moves fast** (b) Moves slow (c) Doesn't move (d) Moves based on force
63. What is the first stage of thermocycler?
(a) Renaturation (b) Annealing (c) **Denaturation** (d) Amplification
64. Quantitative gene expression was analysed by using
(a) Nested PCR (b) **Real time PCR** (c) Inverse PCR (d) Asymmetric PCR
65. _____ is used to overcome unexpected priming
(a) PCR (b) Real time PCR (c) **Nested PCR** (d) Asymmetric PCR
66. _____ is used in sequencing
(a) Nested PCR (b) Real time PCR (c) Inverse PCR (d) **Asymmetric PCR**
67. The PCR which reduces the non-specific priming by varying annealing temperature between the cycles is
(a) Inverse (b) Asymmetric (c) Nested (D) **Touchdown**
68. Restriction and ligation are involved in
(a) **Inverse PCR** (b) Asymmetric PCR (c) Nested PCR (D) Touchdown PCR
69. PCR works readily with DNA of lengths
(a) 3-4kb (b) 4-5kb (c) **2-3kb** (d) 5-6kb
70. Constraints in PCR
(a) Polymerase error (b) Size limitation (c) Non-specific priming (d) **All the above**

71. The most preferred temperature for primer attachment is
(a) **54°C** (b) 72°C (c) 94°C (d) 82°C
72. Scintillation counter is used to measure
(a) α (b) β (c) γ (d) κ
73. In SDS-PAGE, the important chemical used for initiating polymerization is
(a) **APS** (b) SDS (c) Acrylamide (d) Bis-Acrylamide
74. Stacking gel has _____ pore size than separating gel
(a) Small (b) Equal (c) **Large** (d) Relatively small
75. In 2-D gel electrophoresis, first dimension separation is based on
(a) Molecular weight (b) Charge (c) **Isoelectric point** (d) None of the above
76. Protein gets negative charge by
(a) **SDS** (b) TEMED (c) APS (d) β -mercaptoethanol
77. Enrichment of molecules of interest is the goal of
(a) Submarine gel electrophoresis (b) **Preparative electrophoresis** (c) Pulse field gel electrophoresis (d) Field inversion gel electrophoresis
78. Pick out the nucleic acid stain
(a) Silver stain (b) Ethidium bromide (c) Methylene blue (d) **All the above**
79. Electrophoresis works based on electroosmotic flow
(a) Submarine gel electrophoresis (b) Preparative electrophoresis (c) Pulse field gel electrophoresis (d) **Capillary electrophoresis**
80. In 2-D gel electrophoresis, second dimension separation is based on
(a) **Molecular weight** (b) Charge (c) Isoelectric point (d) None of the above

UNIT-5

81. What is the principle of X ray crystallography?
(a) Adsorption (b) Absorption (c) **Diffraction** (d) Reflection
82. Pick out the one dimensional NMR spectroscopy
(a) **Proton** (b) Cosy (c) Hsqc (d) Hmbc
83. X-rays can interact with matter in _____ way
(a) Absorption (b) Scattering (c) Diffraction (d) **All the above**
84. Bragg's law
(a) $\lambda = \sin\theta$ (b) $2\lambda = \sin\theta$ (c) $n\lambda = \sin\theta$ (d) **$n\lambda = 2d\sin\theta$**

85. Structure of DNA was determined by _____ spectroscopy
(a) NMR (b) Raman (c) UV (d) **X-ray**
86. Organic molecules are identified by _____ framework
(a) Carbon (b) Hydrogen (c) Oxygen (d) **Both a and b**
87. Best solvent for proton NMR contains
(a) Proton (b) **No proton** (c) Carbon (d) No carbon
88. A suitable solvent for NMR should
(a) Chemically inert (b) Have no NMR absorption (c) Easily recovered by distillation
(d) **All the above**
89. Magnetic strength can be measured in
(a) Hertz (b) Torr (c) **Tesla** (d) Frequency
90. The applied magnetic field is expressed in NMR as
(a) **B₀** (b) ΔE (c) $h\nu$ (d) M
91. Which of the following is an example of polychromatic light?
(a) **white light** (b) red light (c) blue light (d) ultraviolet light
92. A blue sky is caused by the _____ of high frequency light.
(a) **Scattering** (b) diffraction (c) refraction (d) absorption
93. The tendency for a narrow beam of light to spread or flare out is called
(a) **Diffraction** (b) dispersion (c) refraction (d) reflection.
94. An example of diffraction is
a) **light coming through a keyhole and spreading out in a dark room.**
b) light scattering in the atmosphere.
c) light entering a prism and emerging as a rainbow.
d) light bending as it enters a new medium.
95. If enthalpy change for a reaction is zero, then ΔG° equals to
a) **$-T\Delta S^\circ$**
b) $T\Delta S^\circ$
c) $-\Delta H^\circ$
d) $\ln k_{eq}$

96. ΔG° is defined as the
- Residual energy present in the reactants at equilibrium
 - Residual energy present in the products at equilibrium
 - Difference in the residual energy of reactants and products at equilibrium
 - Energy required in converting one mole of reactants to one mole of products**
97. The study of energy relationships and conversions in biological systems is called as
- Biophysics
 - Biotechnology
 - Bioenergetics**
 - Microbiology
98. What does first law of thermodynamics state?
- Energy can neither be destroyed nor created**
 - Energy cannot be 100 percent efficiently transformed from one type to another
 - All living organisms are composed of cells
 - Input of heat energy increases the rate of movement of atoms and molecules
99. If ΔG° of the reaction $A \rightarrow B$ is -40kJ/mol under standard conditions then the reaction
- Will never reach equilibrium
 - Will not occur spontaneously
 - Will proceed at a rapid rate
 - Will proceed from left to right spontaneously**
100. What is the relationship between ΔG and ΔG° ?
- $\Delta G = \Delta G^\circ + RT\ln([\text{products}]/[\text{reactants}])$
 - $\Delta G = \Delta G^\circ - RT\ln([\text{products}]/[\text{reactants}])$
 - $\Delta G = \Delta G^\circ + RT\ln([\text{reactants}]/[\text{products}])$
 - $\Delta G = \Delta G^\circ - RT\ln([\text{reactants}]/[\text{products}])$**

SECTION-B (5 Marks)

- With a neat sketch explain combined electrode of pH meter.
- Explain the working principle of dialysis membrane.
- Explain the principle of centrifuge in detail.
- Write short note on application of electron microscope.
- Write a short note on pH meter principle.

6. Explain the role of hydrogen ion concentration in biological assays.
7. Draw a neat diagram of transmission electron microscope and explain the components role
8. With a neat sketch explain scanning electron microscope and their components role.
9. Explain shortly about hand centrifuge.
10. Write a short note on rotors.

UNIT-2

11. What is meant by Photometry?
12. Derive Beer-Lambert's law.
13. Describe the components of colorimeter.
14. What is the difference between colorimeter and spectrophotometer?
15. Explain the Principle of ultraviolet visible absorption.
16. What are the uses of the Fluorimeter.
17. What is the Principle of Flame photometer.
18. Define Sonication and add a note on its effects.
19. What is ELISA plate reader?
20. What is the principle behind Elisa testing and plate reader used for?

UNIT-3

21. Short note on principle of thin layer chromatography.
22. Describe shortly about the column characteristics used for chromatography separation.
23. Write a short note on zwitter ions.
24. Explain shortly about the principle of ion exchange chromatography.
25. What is the principle of molecular exclusion chromatography?
26. Explain shortly about the mobile phase of HPLC.
27. Write a short note on mobile phase of gas liquid chromatography.
28. Explain shortly about the principle of mass spectroscopy.
29. Write a short note on condensation, reduction and sublimation.
30. Explain shortly about the application of lyophilisation.

UNIT-4

31. Explain shortly about the principle of AGE.
32. Write the role of SDS in SDS-PAGE
33. Short note on separating gel of SDS-PAGE.
34. Describe shortly about isoelectric focusing.

35. What is the principle of Geiger muller counter?
36. What is the differentiation between solid and liquid scintillation counters?
37. Explain shortly about primer usage in PCR.
38. Short note on primer design.
39. Explain shortly about nested PCR.
40. Write a short note on assymmetric PCR.

UNIT-5

41. What is the principle of X-ray crystallography?
42. Explain shortly about the fundamentals of diffraction.
43. Write a short note on NMR principle.
44. What is the differentiation between first and second dimension NMR spectroscopy?
45. Short note on NMR instrumentation.
46. What are the properties of light?
47. What is reflection and refraction?
48. Write a short note on concept of free energy.
49. Write a short note on ATP Bioenergetics.
50. Describe the First Law of Thermodynamics.

SECTION-C (8 Marks)

UNIT-1

1. Explain in detail about pH meter.
2. Write an essay on transmission electron microscope.
3. Describe in detail about scanning electron microscope.
4. Write about the principle, instrumentation and working mechanism of centrifuge.
5. Explain about the types of rotors in detail.
6. Describe about the types of centrifuge in detail.
7. Write an essay on the application of centrifuge.
8. Write a brief note on dialysis.

UNIT-2

9. Write an essay on the Principle and working mechanism of Colorimeter.
10. Describe the absorption Colorimeter.
11. Write about the applications of Colorimetry.
12. Describe the components of UV Visible Spectrophotometry.
13. Explain the applications of the UV Visible Spectrophotometry.

14. Describe about the components and design of Fluorimeter.
15. Describe the components and working mechanism of Flame photometer.
16. Describe the equipment of Sonicator.
17. Explain the applications of the Sonicator.
18. Describe the detection mode of micro plate assay.

UNIT-3

19. Write an essay on column chromatography.
20. Explain about TLC in detail.
21. Write a brief note on paper chromatography.
22. Describe about ion exchange chromatography in detail.
23. Write an essay on molecular exclusion chromatography.
24. Explain about HPLC in detail.
25. Describe about gas liquid chromatography in detail.
26. Write an essay on mass spectroscopy.
27. Describe about lyophilization stages in detail.

UNIT-4

28. Write an essay on agarose gel electrophoresis.
29. Explain about the role of chemicals used in SDS-PAGE.
30. Describe about immune electrophoresis in detail.
31. Describe about 2-D gel electrophoresis briefly.
32. Explain about capillary electrophoresis in detail.
33. Write an essay on Geiger muller counter.
34. Explain briefly about scintillation counter.
35. Write an essay on principle, working mechanism of PCR.
36. List out the types of PCR and describe in detail.
37. Describe briefly about the application of PCR.

UNIT-5

38. Describe briefly about X-ray crystallography.
39. Discuss about NMR spectroscopy in detail.
40. What are the characteristics of light?
41. What is the difference between reflection and refraction?
42. Write an essay on Chloroplast Bioenergetics.
43. Write an essay on Mitochondrial Bioenergetics.
44. Explain the Second Law of Thermodynamics.

KONGUNADU ARTS AND SCIENCE COLLEGE

(AUTONOMOUS)

College of Excellence

COIMBATORE – 641 029

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QUESTION BANK



III-B.Sc. Biotechnology (2016-2019 Batch)

SUBJECT CODE: 16UBT507

PAPER TITLE: Molecular Biology

PG AND RESEARCH DEPARTMENT OF BIOTECHNOLOGY

APRIL 2019

SECTION-A

Choose the correct answer (1 Mark)

UNIT-1

- The central dogma of molecular biology
(a) **DNA-RNA-Protein** (b) RNA-DNA-Protein (c) Protein-DNA-RNA (d) RNA-Protein-DNA
- Genetic code translated the language of
(a) **Amino acids into that of RNA** (b) Proteins into that of RNA (c) RNA into that of DNA (d) RNA into that of Proteins
- The number of non-sense codons is
(a) 2 (b) **3** (c) 4 (d) 5
- UAA is known as
(a) OPAL (b) Amber (c) **Ochre** (d) Umber
- UAG is known as
(a) OPAL (b) **Amber** (c) Ochre (d) Umber
- UGA is known as
(a) **OPAL** (b) Amber (c) Ochre (d) DNA
- Except _____ each amino acid has multiple codons
(a) Tryptophan (b) Methionine (c) Arginine (d) **Both a and b**
- Inosine of anticodons can pair with any of _____
(a) U (b) C (c) A (d) **All the above**
- The initiator protein for DNA replication is
(a) **DNA AA TP** (b) DNA B (c) Gyrase (d) Primase
- Ligase joins the nicks by creating
(a) Covalent bond (b) **Phosphodiester bond** (c) Hydrogen bond (d) Ionic bond
- Formation of nucleotides of a newly synthesized strand in DNA replication, _____ is required
(a) RNA polymerase (b) **DNA polymerase** (c) Ligase (d) RNA primer
- _____ is required for tension relaxation
(a) **Gyrase** (b) Helicase (c) Ligase (d) SSB protein
- _____ is involved in proof reading mechanism
(a) DNA polymerase I (b) DNA polymerase II (c) **DNA polymerase III** (d) RNA polymerase II

14. _____ is required for primer removal
 (a) **DNA polymerase I** (b) DNA polymerase II (c) DNA polymerase III (d) RNA polymerase II
15. _____ is required for strand stability
 (b) Gyrase (b) Helicase (c) Ligase (d) **SSB protein**
16. _____ is required for unwind helix
 (c) Gyrase (b) **Helicase** (c) Ligase (d) SSB protein
17. _____ is required for nick translation
 (d) Gyrase (b) Helicase (c) **Ligase** (d) SSB protein
18. Gyrase is come under
 (a) **Topoisomerase** (b) SSB protein (c) Helicase (d) Polymerase
19. _____ is required for primer synthesis
 (e) Gyrase (b) Helicase (c) Ligase (d) **primase**
20. The role of replicase enzyme is needed for
 (a) ssDNA (b) **ssRNA** (c) dsRNA (d) dsDNA

UNIT-2

21. In mutational event, when adenine is replaced by guanine, it is case of
 (a) Transition (b) Transcription (c) Transversion (d) **Frameshift mutation**
22. Which of the following has the self-repairing mechanisms?
 (a) DNA and RNA (b) DNA and RNA (c) **Only DNA** (d) DNA and proteins
23. Alteration in a nucleotide sequence which change codon to a termination codon is
 (a) **Non-sense mutation** (b) Mutagenesis (c) Mutation (d) Mutants
24. The enzyme photolyase is used in _____ repair
 (a) Base excision (b) **Photo reactivation** (c) Nucleotide excision (d) None of these
25. Which of the following dimer is most common
 (a) **Thymidine dimer** (b) adenine dimer (c) Cytidine dimer (d) Guanidine dimer
26. Dimer repair mechanism include
 (a) Excision (b) Photo reactivation (c) Recombinational (d) **All the above**
27. Which of the following is dark repair?
 (a) Nucleotide excision repair (b) Base excision repair (c) **Both a and b** (d) None of the above
28. DNA polymerase involved in base excision repair is
 (a) **Polymerase β** (b) Polymerase σ (c) Polymerase λ (d) Polymerase α

29. Which of the following is bypass repair mechanism?
 (a) BER (b) **SOS** (c) NER (d) Recombinational repair
30. DNA repair mechanism is absent in
 (a) Nuclear genome (b) Mitochondrial genome (c) Chloroplast genome (d) **Both b and c**
31. Umu C, umu D gene families and Rec A protein are involved in
 (a) BER (b) NER (c) **SOS** (d) Recombinational repair
32. DNA helicase involved in base excision repair is
 (a) I (b) II (c) **III** (d) IV
33. The first DNA glycosylase discovered is
 (a) **Uracil** (b) Adenine (c) Thymine (d) Methyl adenine
34. The function of Uvr C in nucleotide excision repair is
 (a) To identify lesion in DNA (b) Helicase activity (c) Catalyse incision at 3' end of lesion (d) **Catalyse incision at 5' end of lesion**
35. The activity of AP endonuclease activity is involved in
 (a) **BER** (b) NER (c) Mismatch (d) Double strand break repair
36. In mismatch repair mechanism, endonuclease activity which cuts nascent DNA strand is done by
 (a) **Mut H** (b) Mut L (c) Mut S (d) Uvr D
37. Which is not involved in mismatch repair mechanism in bacteria
 (a) **Mut A** (b) Mut L (c) Mut S (d) Uvr D
38. In mismatch repair mechanism, which of the protein recognize DNA mismatches in genomic DNA
 (a) Mut H (b) Mut L (c) **Mut S** (d) Uvr D
39. The enzyme photolyase repair the thymidine dimer in DNA by
 (a) Oxidation mechanism (b) **Free radical mechanism** (c) Direct bond breaking (d) Adduct formation
40. Two chromophores present in photolyase enzyme are
 (a) NAD and FAD (b) FAD and Folate (c) FADH and Folate- (d) **FAD- and Folate**

UNIT-3

41. The promoter recognition factor for RNA polymerase is
 (a) α (b) β (c) σ (d) β^1

42. The core promoter region for prokaryotic transcription is
(a) GA box (b) SD sequence (c) CAAT box (d) **TATA box**
43. In prokaryotes, protein release factor RF1 recognises_____ codons
(a) UAG (b) UGA (c) UAA (d) **Both a and c**
44. In prokaryotes, post transcription modification is needed for
(a) tRNA (b) mRNA (c) rRNA (d) **Both a and c**
45. The involvement of Rut site has to be found in prokaryotic transcription
(a) initiation (b) **termination** (c) elongation (d) none of the above
46. Molecular chaperones plays a role in
(a) protein folding (b) protein degradation (c) protein export (d) **All the above**
47. TATA box is otherwise called as
(a) Core promoter (b) pribnow box (c) Goldberg-hogness box (d) **All the above**
48. RNA polymerase involved in prokaryotic transcription is
(a) Versatile enzyme (b) Holoenzyme (c) Multimeric protein (d) **All the above**
49. -35 sequence is otherwise called as
(a) CAAT box (b) SD sequence (c) **GA box** (d) Weak promoter
50. Bacterial ribosomes contains_____ kinds of rRNA
(a) 4 (b) **3** (c) 5 (d) 2
51. The translational initiation factor which prevents the association of 50S and 30S subunits is
(a) IF1 (b) IF2 (c) **IF3** (d) IF4
52. The elongation factor involve in translocation of mRNA is
(a) **EF-G** (b) EF-TU (c) EF-TS (d) EF-S
53. Post translation modification is categorised as
(a) Protein folding (b) Proteolytic cleavage (c) Covalent attachment (d) **All the above**
54. 26S proteasome complex contains_____enzymes for ubiquitination
(a) 4 (b) **3** (c) 5 (d) 6

55. Post translational mode of protein export depends on
(a) Sec A (b) Sec B (c) SRP (d) **Both a and b**
56. _____ helps in the translocation of folded form of protein
(a) SecA (b) DNA J (c) DNA K (d) **Both b and c**
57. Protein export happens through
(a) Sec YEG (b) Yid C (c) SRP (d) **Both a and b**
58. _____ plays a major role in translational initiation
(a) **16S rRNA** (b) 5S rRNA (c) 23S rRNA (d) 28S rRNA
59. Prokaryotic mRNA is
(a) Monocistronic (b) Bicistronic (c) Tricistronic (d) **Polycistronic**
60. *E. coli* contains _____-tRNA molecule
(a) 3 (b) **4** (c) 5 (d) 6

UNIT-4

61. The gene code for β -galactosidase
(a) **Z** (b) Y (c) A (d) Camp
62. The first identified transposon is
(a) IS element (b) **AC/DS element** (c) Copia elements (d) Ty elements
63. Alu sequence belongs to
(a) LINES (b) LTR (c) **SINES** (d) Non-LTR
64. Pribnow box consists of _____ nucleotides
(a) 4 (b) 5 (c) **6** (d) 7
65. GA box consists of _____ nucleotides
(a) **6** (b) 4 (c) 5 (d) 7
66. Transcription start site is seen in
(a) **Core promoter** (b) Proximal promoter (c) Upstream region (d) Downstream region
67. The mutation of consensus sequence causes
(a) Gastric ulcer (b) Huntington's disease (c) Gilbert's syndrome (d) **All the above**
68. CAAT box is seen in
(a) Core promoter (b) Proximal promoter (c) **Upstream region** (d) Downstream region

69. Eukaryotes contains
 (a) CAAT box (b) TATA box (c) Distal promoter (d) **Both a and c**
70. CRP, an activator protein present in lac gene of *E. coli* has _____ binding sites
 (a) **2** (b) 3 (c) 1 (d) 4
71. Enhancer is seen in
 (b) Upstream region (b) Downstream region (c) Coding region (d) **Anywhere**
72. The major component needed for enhancer's function is
 (a) Activator (b) Promoter (c) Silencer (d) **DNA bending protein**
73. Silencer has binding site for
 (a) Activator (b) Regulator (c) **Repressor** (d) Transcriptional factor
74. Silencer is seen in
 (a) **Upstream region** (b) Downstream region (c) Coding region (d) Anywhere
75. Silencer affects gene expression through
 (a) **Intron splicing** (b) Affect transcriptional factor (c) GTF assembly (d) **All the above**
76. _____ are the recognition sites for transcriptional factors
 (a) Distal elements (b) Regulatory elements (c) **Response elements** (d) Proximal elements
77. Gene expression has been controlled by
 (a) Activator (b) Enhancer (c) Repressor (d) **Transcriptional factor**
78. Non-composite transposons contains
 (a) Antibiotic resistant gene (b) IR flanking region (c) IS elements (d) **Both a and b**
79. Copia elements are seen in
 (a) Bacteria (b) Plants (c) Human (d) **Drosophila**
80. Ty elements are seen in
 (a) **Yeast** (b) Plants (c) Human (d) Drosophila

UNIT-5

81. Holliday junction formation happens in
 (a) Post synapsis (b) Pre synapsis (c) **Synapsis** (d) Extension
82. Lambda repressor code by
 (a) **CI gene** (b) O gene (c) P gene (d) Cro gene
83. Illegitimate recombination =
 (a) Homologous (b) **Non – Homologous** (c) Sequence specific (d) Enzyme specific

84. Lambda activator code by
(a) CI gene (b) O gene (c) P gene (d) **Cro gene**
85. Pick out the immediate early gene of lambda phage
(a) **N** (b) Q (c) P (d) L
86. Pick out late gene of lambda phage
(a) L (b) N (c) **Q** (d) P
87. Replication and recombination are due to _____ gene
(a) L (b) **N** (c) Q (d) P
88. Phage assembly and cell lysis are due to _____ gene
(a) L (b) N (c) **Q** (d) P
89. Activation of C1 repressor by _____ gene
(a) O (c) P (d) **CII** (d) N
90. Lambda activator code by
(a) CI gene (b) O gene (c) P gene (d) **Cro gene**
91. M13 phage is a
(a) **Filamentous phage** (b) Temperate phage (c) Spherical phage (d) RNA phage
92. Lambda phage is a
(a) Filamentous phage (b) **Temperate phage** (c) Spherical phage (d) RNA phage
93. COS site is responsible for
(a) **Circularization** (b) Replication (c) Lytic cycle initiation (d) Lysogeny cycle initiation
94. The size of lambda phage is
(a) **4.8kb** (b) 3.6kb (c) 3.2kb (d) 5.2kb
95. The important Recombinase involved in homologous recombination is
(a) Rec B (c) **Rec A** (c) Rec D (d) Rec C
96. Rec A is responsible for
(a) Strand exchange (b) Recognition of single strand 3'end (c) Nucleoprotein complex formation (d) **All the above**
97. Xox site is a recognition site for
(a) Rec A (b) **Cre** (c) Rfx (d) None of the above
98. Holliday junction is cut by
(a) **Ruv** (b) Rec A (c) RecBCD (d) Cre

99. Consequence of recombination leads to

- (a) Loss of genetic information (b) DNA repair (c) Speed of mobile elements (d) **All the above**

100. Chi site is a _____ base sequence

- (a) 6 (b) **8** (c) 5 (d) 9

SECTION-B (5 Marks)

UNIT-1

1. Write short notes on wobble hypothesis.
2. Give short notes on Theta rolling circle model.
3. Elucidate – Genetic code with appropriate evidence.
4. Inscribe the salient features of reverse transcriptase in RNA replication.
5. Explain shortly about degeneracy.
6. Write a short note on replicase enzyme.

UNIT-2

7. What is mutagenesis? How would you explain?
8. How could you differentiate Spontaneous and conditional mutants?
9. How mutations are benefits to the living organism? Explain in detail.
10. How DNA damage is takes place in cell? Explain briefly.
11. Explain shortly about Ames test.
12. Write a short note on DNA damage.
13. Give a short note on reversion and suppression mutations.
14. Explain shortly about mismatch repair.
15. Write a short note on excision repair.
16. Give a short note on recombination repair .

UNIT-3

17. Give short notes on prokaryotic transcriptional initiation.
18. Write short notes on prokaryotic transcriptional termination.
19. List out salient features of RNA polymerase involved in prokaryotic transcription.
20. Short notes on prokaryotic transcriptional elongation.
21. Explain about Rho enzyme shortly
22. Write a short note on ubiquitination
23. Give short note on translational initiation
24. Explain about factors involved in translational elongation.

25. Write short notes on translational termination.
26. Give short notes on covalent attachments during post translational modification.

UNIT-4

27. Explain about promoter in general.
28. Give short note on enhancer mechanism.
29. Write short note on TATA box.
30. Give short note on silencer mechanism.
31. Explain about the structural genes of lac operon.
32. What is a need for lac operon concept?
33. Explain about IS elements shortly.
34. Give short note on composite transposons.
35. Write short note on non-composite transposons.
36. Explain about LINES and SINES

UNIT-5

37. List out salient features of Rec A.
38. Draw a neat sketch of lambda genome.
39. Write about the characteristics of lambda genome.
40. What is the reason behind the entry of lytic cycle.
41. Explain about lysogeny cycle.
42. Explain about Cro gene activation.
43. Give short notes on CI gene activation.
44. Explain about immediate early genes of lambda phage shortly.
45. Give short note on late genes of lambda phage.
46. Write about non-homologous recombination shortly.

SECTION-C (8Marks)

UNIT-1

1. Give detail account on DNA replication mechanism in prokaryotes.
2. Write an essay on DNA replication in eukaryotes.
3. Write an essay on enzymes involved in prokaryotic and eukaryotic DNA replication.
4. Give a detailed note on RNA replication.
5. Discuss about genetic code, degeneracy and wobble hypothesis in detail.

UNIT-2

6. Explain the biochemical basis of mutation.
7. How will you differentiate the mutants?
8. What is reverse and suppression mutation? Explain in detail
9. How DNA damage is occur in nature? Explain the DNA repair mechanism.
10. Explain about biochemical basis of mutation.
11. Write an essay on base excision and nucleotide excision repair mechanism.
12. Describe about Recombinational repair mechanism in detail.
13. Explain about mismatch repair mechanism in detail.

UNIT-3

14. Write a brief note on prokaryotic transcription process.
15. Describe about the factors involved in prokaryotic transcriptional process.
16. Explain in detail about prokaryotic rRNA processing.
17. Give a detailed account on prokaryotic tRNA processing.
18. Describe about prokaryotic translational process in detail
19. Explain briefly about the post translational modification in prokaryotes.
20. Write an essay on protein export.
21. Discuss about translational regulation in detail.

UNIT-4

22. Give detailed account on cis-regulatory elements.
23. Explain trans-regulatory elements in detail.
24. Describe about lac operon model in detail.
25. Write a brief notes on eukaryotic transposons.
26. Describe IS elements in detail.
27. Give a detailed account on prokaryotic transposons.

UNIT-5

28. Give detail account on homologous recombination.
29. Write an essay on enzymes involved in homologous recombination.
30. Discuss about Rec A and Cre in detail.
31. Give detailed account on life cycle of lambda phage.
32. Describe briefly about transcriptional switch ON genes of lambda phage.
33. Write an essay on transcriptional switch OFF genes of lambda phage.

KONGUNADU ARTS AND SCIENCE COLLEGE

(AUTONOMOUS)

College of Excellence

COIMBATORE – 641 029

PREPARED BY

Dr. M. GOGUL RAMNATH

QUESTION BANK



III-B.Sc. Biotechnology (2016-2019 Batch)

SUBJECT CODE: 15UBT611

PAPER TITLE: Plant Biotechnology

PG AND RESEARCH DEPARTMENT OF BIOTECHNOLOGY

APRIL 2019

SECTION-A

Choose the correct answer (1 Mark)

UNIT-1

1. Which organelle contains gene for coding large subunit of rubisco protein
(a) **Chloroplast** (b) Nucleus (c) Mitochondria (d) Endoplasmic reticulum
2. Multipartite genome organization was seen in
(a) Chloroplast (b) Nucleus (c) **Mitochondria** (d) Endoplasmic reticulum
3. How many bp of DNA links two nucleosome particle
(a) 40-60 (b) 70-90 (c) 80-100 (d) **50-70**
4. Promiscuous DNA means 90% of mitochondria DNA homologous to
(a) **chloroplast DNA** (b) nuclear DNA (c) endoplasmic reticulum DNA
(d) golgi complex DNA
6. Which organelle contains gene for coding small subunit of rubisco protein
(a) Chloroplast (b) **Nucleus** (c) Mitochondria (d) Endoplasmic reticulum
7. Plant mitochondrial genome contains _____ ribosomal RNAs
(a) 26S (b) 5S (c) 18S (d) **all the above**
8. Inner circle of mitochondrial genome contains
(a) **80% chloroplast gene** (b) ORFs (c) tRNA genes (d) rRNA genes
9. Middle circle of mitochondrial genome contains
(a) 80% chloroplast gene (b) **ORFs** (c) tRNA genes (d) rRNA genes
10. Outer circle of mitochondrial genome contains
(a) tRNA gene (b) ORFs (c) tRNA genes (d) **both a and c**
11. mtDNA contains for genes for
(a) **tRNA-22** (b) Trna-24 (c) tRNA-20 (d) tRNA-21
12. Ribosomal proteins encoded by plant nuclear genome
(a) **rps 19** (b) rps 7 (c) rps 12 (d) rps 21
13. The chloroplast specific import sequence is rich in
(a) **Serine, Threonine** (b) Threonine, Lysine (c) Leucine, Threonine (d) Leucine, Lysine
14. Pick out inner membrane channel protein
(a) TOC 34 (b) TOC 75 (c) **TIC** (d) TOC 86
15. Mitochondria doesnot contain
(a) **HSP100** (b) HSP 70 (c) HSP 60 (d) both b and c

16. Outer membrane of mitochondria has
 (a) Tim 22 (b) OXA (c) **TOM** (d) Tim 23
17. Prevention of protein misfolding in mitochondrial matrix was achieved by
 (a) **HSC 70** (b) HSC 50 (c) HSC 45 (d) HSC 80
18. *Arabidopsis thaliana* genes organised into_____ chromosomes
 (a) 6 (b) **5** (c) 7 (d) 8
19. The genome size of *Arabidopsis thaliana* is
 (a) **125MB** (b) 105MB (c) 175MB (d) 2015MB
20. *Arabidopsis thaliana* can synthesis unique proteins nearly
 (a) 100 (b) **150** (c) 180 (d) 235

UNIT-2

21. Superiority of F1 plant over parent plants is termed as_____ heterosis
 (a) Average (b) **Better parent** (c) Standard (d) Relative
22. 100% male sterile plants can be achieved by_____ male sterility
 (a) **Cytoplsmic** (b) Genetic (c) Cytoplasmic genetic (d) Endoplasmic
23. Regeneration of haploid plants was initiated by
 (a) Murashige & Skoog (b) Cocking (c) **Guha & Maheswari** (d) Hanning
24. Pick out the macronutrient
 (a) **Nitrogen** (b) Iron (c) Boron (d) Manganese
25. Superiority of F1 plant over standard plants is termed as_____ heterosis
 (a) Average (b) Better parent (c) **Standard** (d) Relative
26. Superiority of F1 plant in between two parent plants is termed as_____ heterosis
 (a) Heterobeltiosis (b) Better parent (c) **Standard** (d) Relative
27. Non allelic interaction is otherwise called as
 (a) Dominant (b) Over dominance (c) co dominance (d) **Epistasis**
28. Fixation of heterosis was achieved by fertilization without seeds and is termed as
 (a) **Apomixis** (b) Vegetative propagation (c) Balanced lethal system
 (d) Polyploidy
29. The media specifically used for orchids is
 (a) Gauthert (b) Nitsch (c) Heller (d) **Knudson**

30. The media used for woody plant is
 (a) Gauthert (b) **LS medium** (c) Heller (d) Knudson
31. Autoclave is a _____ sterilization method
 (a) **Moist heat** (b) Dry heat (c) UV (d) Filter
32. Steripot is a _____ sterilization method
 (a) Moist heat (b) **Dry heat** (c) UV (d) Filter
33. The size of HEPA filter which was used in laminar air flow chamber is
 (a) **0.3 μ M** (b) 0.6 μ M (c) 0.8 μ M (d) 1.2 μ M
34. The cytokinin found in nature
 (a) IAA (b) IBA (c) 2,4-d (d) **Zeatin**
35. The auxin found in nature
 (a) **IAA** (b) IBA (c) 2,4-d (d) Zeatin
36. Calcium is useful for
 (a) **Cell wall synthesis** (b) Fruit ripening (c) Respiration
 (d) Root growth
37. Translocation of sugar was carried out by
 (a) Manganese (b) Zinc (c) **Boron** (d) Nitrogen
38. Yellow spot disease is a deficiency of
 (a) **Molybdenum** (b) Zinc (c) Boron (d) Nitrogen
39. Miller *et al* in 1953 discovered
 (a) Auxin (b) Ethylene (c) **Cytokinin** (d) Ascorbic acid
40. The most commonly used hormone for seed germination is
 (a) **Gibberellic acid** (b) Auxin (c) Cytokinin (d) Ethylene

UNIT-3

41. Plant cells are
 (a) Multipotent (b) **Totipotent** (c) Pluripotent (d) Omnipotent
42. Organism genetically identical to its parent is termed as
 (a) Chimera (b) Cybrid (c) **Clone** (d) Habituate
43. The explant used for true haploid plant production is
 (a) Embryo (b) Seed (c) **Pollen** (d) Shoot tip
44. The main purpose for synthetic seed preparation is
 (a) Germination (b) Propagation (c) **Preservation** (d) Cultivation

45. Specific medium designed for callus induction
(a) MS medium (b) **Gamborg medium** (c) Hildebrandt (d) N6 medium
46. The meristemic region taken as explant for micropropagation
(a) Nodal region (b) Root tip (c) Shoot tip (d) **All the above**
47. Indirect plant regeneration
(a) Shoot tip culture (b) Embryo culture (c) **Callus culture** (d) Root tip culture
48. Pick up the single cell culture technique
(a) Droplet culture (b) Feeder layer technique (c) Hanging droplet culture (d) **Filter paper raft nurse culture**
49. In general, protoplast culture is followed by
(a) Somatic embryogenesis (b) **Somatic hybridization** (c) Cell suspension (d) Plant regeneration
50. Plant used for studying recessive genes
(a) Aneuploid plant (b) **Haploid plant** (c) Diploid plant (d) *In vitro* raised plant
51. Embryo formed from unfertilized egg is called as
(a) Nucellar embryo (b) Androgenetic embryo (c) Adventitious embryo (d) **Parthenogenetic embryo**
52. The order of embryo development stages
(a) **Globular-Heart-Torpedo** (b) Torpedo-Heart-Globular (c) Heart-Torpedo-Globular (d) Heart-Globular-Torpedo
53. Most widely used auxin for callus induction is
(a) IAA (b) Zeatin (c) **2,4-d** (d) NAA
54. Enzymes used for protoplast isolation
(a) Cellulase (b) Hemicellulase (c) Pectinase (d) **All the above**
55. The culture technique used to overcome juvenile phase is
(a) Callus culture (b) **Micropropagation** (c) Seed germination (d) Pollen culture
56. 200-600rpm was achieved in
(a) **Spin culture** (b) Shake culture (c) Nurse culture (d) Microchamber
57. Single cell culture technique is similar to
(a) Hanging droplet (b) Co culture (c) **Droplet** (d) Bead culture
58. The cavity slide is used in _____ technique
(a) **Hanging droplet** (b) Co culture (c) Droplet (d) Bead culture

59. The technique used to overcome sexually incompatibility of certain plants is
(a) Somatic embryogenesis (b) Callus (c) Micropropagation (d) **Somatic hybridization**
60. Sodium alginate was discovered by
(a) Murashige (b) **Redenbanch *et al*** (c) Kitto (d) Janick

UNIT - 4

61. The most necessary component used for transformation is
(a) ORI (b) **Vir gene** (c) Gene of interest (d) All the above
62. Pick out the master gene for virulence in Ti plasmid
(a) **Vir A** (b) Vir B (c) Vir C (d) Vir D
63. Wounded plants which oozes out phenolic compound to heal is
(a) Kaemferol (b) **Acetosyringone** (c) Quercetin (d) Tannin
64. Single T strand was synthesised by
(a) **VirD1/VirD2** (b) Vir B (c) Vir E1/E2 (d) Vir G
65. The connection between plant cell and agrobacterium and T-DNA transfer was facilitated by
(a) VirD1/VirD2 (b) **Vir B** (c) Vir E1/E2 (d) Vir G
66. T-DNA was guided to nuclear pore complex
(a) **VIP I** (b) VIP II (c) psc A (d) Tra I
67. The single strand binding protein which protects T-strand is coded by
(a) Vir D1 (b) Vir D2 (c) Vir B (d) **Vir E2**
68. Vir A protein has
(a) 2 domains (b) **3 domains** (c) 4 domains (d) 5 domains
69. Thin root and nodule formation in hairy root disease was facilitated by
(a) **Rol B and C** (b) Rol A and B (c) Rol C and D (d) tms1 and tms2
70. Production of auxin in hairy root disease was facilitated by
(a) Rol B and C (b) Rol A and B (c) Rol C and D (d) **tms1 and tms2**
71. Most widely seen strain in *A. rhizogene* infected plant is
(a) **Agropine** (b) Mannopine (c) Cucumopine (d) Mikimopine
72. The strong promoter in cauliflower mosaic virus is
(a) 16S RNA (b) **35S RNA** (c) 19S RNA (d) 5S RNA

73. The gene responsible for nitrogen fixation is
 (a) nod (b) **nif** (c) N₂ (d) vir
74. The gene responsible for nodule formation is
 (a) **nod** (b) nif (c) N₂ (d) vir
75. Gene gun method is otherwise called as
 (a) Biolistic (b) Particle bombardment (c) Electroporation (d) **Both a and b**
76. The method for transferring genetic material to eukaryotic cell is
 (a) Transformation (b) **Transfectio** (c) transduction (d) Conjugation
77. The size of Ti plasmid is
 (a) **200kb** (b) 250kb (c) 350kb (d) 180kb
78. The present in Ti plasmid which is responsible for auxin production is
 (a) tmr (b) tml (c) **tms** (d) ocs
79. The core enzyme for nitrogen fixation was coded by _____ gene
 (a) nif K (b) nif D (c) nif J (d) **Both a and b**
80. The gene responsible for ATP utilization for fixing nitrogen is
 (a) **nif H** (b) nif K (c) nif J (d) nif D

UNIT – 5

81. The order of biosynthesizing polyhydroxybutyrate is
 (a) **Condensation>Reduction>Polymerization**
 (b) Reduction>Condensation>Polymerization
 (c) Polymerization>Condensation>Reduction
 (d) Polymerization>Reduction>Condensation
82. Pha B gene is responsible for _____ in PHB synthesis
 (a) Condensation (b) Polymerization (c) **Reduction** (d) Acetylation
83. The advantage of plantigen production
 (a) Cost effective (b) Reduce downstream process (c) Edible vaccine (d) **All the above**
84. The plantibody produced by four transgenic tobacco lines through crossing is
 (a) IgG (b) **sIgA** (c) IgM (d) IgD
85. The first plantibody produced by transgenic tobacco is
 (a) IgG2 (b) IgG4 (c) IgG3 (d) **IgG1**

86. The transgenic plant which inhibit EPSP is resistant to
 (a) Virus (b) Insect (c) **Herbicide** (d) fungus
87. The gene isolated from Daffodil bacteria to produce golden rice is
 (a) **Psy** (b) crt1 (c) crt2 (d) Both b and c
87. The gene responsible for tomato softening present in tomato is
 (a) pTOM 5 (b) **pTOM 6** (c) pTOM 13 (d) pTOM 16
88. Most essential component for plant viral infection
 (a) **Capsid** (b) Nuclear material (c) Virion (d) All the above
89. The gene responsible for tomato ripening present in tomato is
 (b) pTOM 5 (b) pTOM 6 (c) **pTOM 13** (d) pTOM 16
90. The gene responsible for red colouration present in tomato is
 (c) **pTOM 5** (b) pTOM 6 (c) pTOM 13 (d) pTOM 16
91. The advantage of edible vaccine
 (a) Cost effective (b) No need of extensive storage (c) No need of purification process (d) **All the above**
92. Flavr savr was produced in the year of
 (a) **1990** (b) 2000 (c) 1988 (d) 2006
93. Golden rice project was successfully finished in the year of
 (a) 1998 (b) 2008 (c) **2002** (d) 1992
94. Cry 1 protein is resistance to
 (a) **Lepidoptera** (b) Diptera (c) Coleoptera (d) Both a and b
95. The most important gene taken from bean plant for chitinase production in transgenic plant is
 (a) CH7B (b) CH2B (c) **CH5B** (d) CH8B
96. Chitinase belongs to _____ class of pathogenesis related protein
 (a) **3** (b) 5 (c) 7 (d) 1
97. The number of transgenic plants require for secretary antibody production
 (a) 3 (b) **4** (c) 2 (d) 6
98. Pha A gene is responsible for _____ in PHB synthesis
 (a) **Condensation** (b) Polymerization (c) Reduction (d) Acetylation
99. Pha C gene is responsible for _____ in PHB synthesis
 (a) Condensation (b) **Polymerization** (c) Reduction (d) Acetylation

100. The number of genes needed for PHB production in cytoplasm

(a) 2

(b) 3

(c) 4

(d) 1

SECTION-B (5 Marks)

UNIT-1

1. Give short note on chloroplast genome size and genes.
2. Brief account on the synthesis of proteins in chloroplast.
3. Explain about genes involved in photosynthesis.
4. Write short note on rubisco protein synthesis.
5. Give short notes on mitochondrial genes.
6. What is multipartite genome organization?
7. Explain about the characteristics of nuclear genes.
8. Give short note on DNA packing and nucleosome arrangement in plants.
9. Explain about protein channels of chloroplast.
10. Brief account on genes present in *Arabidopsis*.

UNIT-2

11. Write short note on effects and uses of heterosis in plant breeding.
12. Briefly explain theories of heterosis.
13. Give an account on fixation of heterosis.
14. Explain about factors affecting heterosis.
15. Short notes on types of heterosis.
16. Give a short note on cytoplasmic male sterility.
17. Explain about genetic male sterility.
18. Write a short note on moist heat sterilization.
19. Give an account on major types of media
20. Write short notes on gibberellic acid biosynthesis.

UNIT-3

21. Write short notes on callus induction.
22. Brief account on synthetic seed preparation
23. Explain the paper raft nurse technique.
24. Short note on microdroplet culture technique.
25. Explain the way to find out the genetic variation between *invivo* and *in vitro* raised plants.
26. Write short notes on factors influencing micropropagation.
27. Write short note on enzymatic isolation of protoplast.

28. Give short note on anther culture.
29. Explain about pollen culture shortly.
30. Discuss about direct route of somatic embryogenesis.

UNIT-4

31. Describe the mechanical method of gene transfer. List out its merits and demerits.
32. Give short note on electroporation
33. Explain about PEG mediated transformation method.
34. What are opines? Outline the classification of Ti plasmids based on opines. .
35. Short notes on vir genes
36. Give short note on nif genes.
37. Write shortly about nod genes.
38. Explain about gene gun method.
39. Describe the *Agrobacterium characteristics*.
40. Write short note on CaMV genome with neat diagram.

UNIT-5

41. Explain about BT cotton.
42. Write a short note on antisense RNA technology with suitable example.
43. Explain shortly about the advantages of plantibody.
44. List out the advantages of biodegradable plastics.
45. List out some plantigens with their significances.
46. Short note siadvantages of GM foods.
47. Explain about biosafety issues regarding GM foods.
48. Describe about chitinase gene.
49. Write short note on role of coat proteins in virus resistance.
50. Short note on interferon.

SECTION-C (8 Marks)

UNIT-1

1. Describe mitochondrial genome organization in detail.
2. Explain plant nuclear genome organization in detail.
3. Explain chloroplast genome organization in detail.
4. Discuss briefly about rubisco protein synthesis in plants.
5. Discuss in detail about protein targeting in stromal region of chloroplast.

6. Explain briefly about thylakoid protein targeting.
7. Give a brief note on mitochondria protein targeting.
8. Discuss in detail about the genome organization in *rabidopsis*.
9. Why *Arabidopsis* as a model plant?
10. Describe about role of channel proteins in protein targeting in mitochondria and chloroplast in detail.

UNIT-2

11. Describe about auxin biosynthesis in detail.
12. Write a detailed note on effect of auxin in plant growth and development.
13. Discuss about cytokinin biosynthesis in detail.
14. Give a brief note on influence of cytokinin in plant growth and development.
15. Describe about biosynthesis of gibberellic acid and its effect in plant growth.
16. Discuss in detail about theories, features, types and fixation of heterosis.
17. Write a brief note on male sterility.
18. Give a detailed account on laboratory organization with a neat sketch.
19. Discuss about the types of plant tissue culture medium and add notes on role of medium constituents.
20. Write a brief note on sterilization techniques used in plant tissue culture laboratory.

UNIT-3

21. What is micropropagation and describe the techniques/stages involved in micropropagation with a neat sketch.
22. Describe the procedure involved in haploid production.
23. Give a brief account on somatic embryogenesis..
24. Explain protoplast isolation in detail.
25. Discuss about protoplast culture techniques in detail.
26. Give a brief note on callus induction,
27. Explain about somaclonal variation in detail.
28. Describe briefly about cell suspension culture.
29. Explain in detail about single cell culture techniques.
30. Write a brief note on synthetic seed preparation.

UNIT-4

31. Describe briefly about physical methods of gene transfer.
32. Describe the chemical methods of gene transfer into plant cells with suitable examples
33. Write a brief note on nodule formation.
34. Discuss in detail about nitrogen fixation in plants.
35. Describe T-DNA transfer mechanism in detail.
36. Describe the organization of Ti plasmid and Ri plasmid.
37. Describe the biolistic method of direct DNA delivery. Highlight its advantages and disadvantages.
38. Explain the application of gene transfer methods in detail.
39. Give a brief account on CaMV.
40. Why tobacco as a model plant for transformation studies?

UNIT-5

41. Give a brief note on chitinase based fungal resistance.
42. Give a detail account on coat mediated virus resistance transgenic plants.
43. Discuss in detail about BT cotton.
44. Describe briefly about herbicide resistance.
45. Explain about golden rice in detail.
46. Give a brief account on flavr savr tomato using antisense RNA technology.
47. Give a brief account on plantibody production and list out its advantages.
48. Describe edible vaccine in detail with suitable examples.
49. Explain briefly about biodegradable plastics with advantages
50. Brief note on biosafety issues of GM food.

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QUESTION BANK

SUBJECT CODE: **16UBT506**

TITLE OF THE PAPER: **IMMUNOLOGY**

COMPILED BY

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PG AND RESEARCH DEPARTMENT OF BIOTECHNOLOGY

December 2018

CHOOSE THE CORRECT ANSWER

IMMUNOLOGY

1. Nonspecific host defence that exist prior to exposure to an antigen is called
a) acquired immunity **b) innate immunity** c) adaptive immunity d) all of these
2. First line of defence include
a) skin b) mucus c) lysozyme secretion **d) all of these**
3. The function of macrophages include
a)phagocytosis b)antigen presenting cells c)cytokine production **d) all of these**
4. Which of the following is the site of T cell maturation?
a) Bone marrow **b) thymus** c)spleen d)appendix
5. Primary lymphoid organs include
a)thymus and spleen **b)thymus and bone marrow** c)thymus,bone marrow and spleen
d)thymus, bone marrow, spleen and lymph nodes
6. B cells are activated by
a) complement b)antibody c)interferon **d)antigen**
7. B cells that produce and release large amounts of antibody are called
a) memory cells b)basophils **c)plasma cells** d)killer cells
8. NK cells develop from which cell lineage?
a) myeloid b)erythroid c)B cell **d)none of the above**
9. Clonal selection occurs when antigen is encountered by
a) Basophils **b)T cells** c)Neutrophils d)Mast cells
10. Innate immunity is
a) nonspecific b)specific c)both d)none of the above
11. The immunity acquired after birth is called
a) passive b)innate **c)adaptive** d)active
12. CD8 is a marker of
a) B cells **b) helper T cells** c)cytotoxic T cells d)neutrophil precursor

13. Tissue damage caused by wound or invading pathogenic organisms induces a complex sequence of events collectively known as

a) opsonisation b)phagocytosis **c)inflammation** d)none of these

14. Kupffer cells are macrophages found on

a) lung b)bone c)nephrons **d)liver**

15. B cell has receptor on its surface which is

a) monomeric IgM b)dimericIgM c)monomeric IgG c)B cell receptor

16. Origin and maturation of B cells takes place at

a) spleen b)thymus **c)bone marrow** d)lymph nodes

17.B cells differentiate to form

a) plasma cells b)effector cells **c)plasma cells and memory B cells** d)none of these

18. Humoral immunity is mediated by

a) B cells b)macrophages c)both a and b d)phagocytes

19. The lymphocyte which has bilobed nucleus and granulated cytoplasm is called

a) Eosinophils b)Neutrophils c)Basophils d)Mast cells

20. Which cells play an important role in allergic response?

a) mast cells b)eosinophils c)dendritic cells d)basophils

21. Antibodies clear out antigens by

a) neutralization b)precipitation c)agglutination **d) all of these**

22. Which of the following is the most abundant immunoglobulin?

a) IgM **b)IgG** c)IgA d)IgE

23.Any molecule that induces or elicits an immune response is called

a) antigens b)antibodies c)epitope **d)immunogens**

24. A molecule that reacts with specific antibody but is not immunogenic by itself is called

a) carrier b)antigen **c)hapten** d)immunogen

25. Which of the following is a hapten

a) cyanide b)paracetamol c) **penicillin** d) none of these

26. Which substance when potentiates the immune response when incorporated or injected simultaneously with antigen?

a) **adjuvant** b) hapten c) epitope d) paratope

27. The degradation of antigens is called

a) antigen binding b) **antigen processing** c) antibody binding d) antibody processing

28. Which peptide class was identified by T_c cell?

a) **class I MHC** b) class II MHC c) both d) none of these

29. The natural killer cells are activated by

a) **interleukin-2** b) interferon c) interleukin-6 d) interleukin-7

30. The shape of the antibody IgA is

a) X-shaped b) V-shaped c) **Y-shaped** d) U-shaped

31. The function of antibody is

a) opsonisation b) agglutination c) precipitation d) **all of these**

32. The immunoglobulin IgG is found most predominantly in

a) serum b) **blood** c) milk d) saliva

33. The immunoglobulin IgA is a

a) **dimer** b) polymer c) monomer d) polymer

34. The half life of IgD is

a) 25 days b) 6-8 days c) **2-3 days** d) 5 days

35. IgD is a primary antibody found from most fishes to mammals except

a) animals b) reptiles c) insects d) **birds**

36. Who discovered the concept of haptens?

a) **Karl Landsteiner** b) Louis Pasteur c) Edwin Jenner d) Robert Hook

37. What is the size of the β 2-M glycoprotein?

a) **12KDa** b) 14KDa c) 15KDa d) 20KDa

38. α chain is associated with β 2M to become a

a) **functional MHC I** b) functional MHC II c) functional MHC III d) all the above

39. Which is the example of the adjuvants?

a) poison ivy b)hydralazine c)**Alum** d)penicillin

40. Haptens are

a) **low molecular weight compounds** b)high molecular weight compounds c)both d)none of these

41. In classical pathway of complement biology, the C2a binds with C4b to form

a) **C4b2a** b)C2b4a c)C4b d)C2a

42. The alternative pathway is a step-wise immunological reaction of the complement system activated by

a) antigen-antibody complex **b)properdin** c)protease enzyme d)none of these

43. How many complements are involved in classical pathway?

a) **11** b)8 c)7 d)6

44. C3bBb functions as C3 convertase in

a) classical pathway **b)alternate pathway** c)lectin pathway d)none of these

45. Hypersensitivity simply means

a) **allergy** b)itching c)redness d)fever

46. The allergy reaction produced by the antigen-antibody complex is called

a) Type I b)Type II **c)Type III** d)Type IV

47. In type II hypersensitivity, which type of immunoglobulins are involved?

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

48. Anaphylaxis belongs to

a) **Type I** b)Type II c)Type III d)Type IV

49. Hypersensitivity caused by the interaction between antigens and sensitized T cells are

a) Type I b)Type II c)Type III **d)Type IV**

50. The MAC is composed of a complex of

a) **5 complement proteins** b)3 complement proteins c)4 complement proteins d)6 complement proteins

51. The term cytokine is derived from

a) **greek** b)latin c)French d)none of these

52. When the cytokine binds to the receptor of the cell producing it and produces altered gene expression, the action is called

a)paracrine **b)autocrine** c)endocrine d)redundancy

53. The inhibition of one cytokine by another cytokine is called

a) pleiotrophy b)redundancy **c)antagonism** d)synergy

54. Which are the regulatory proteins secreted by monocytes or macrophages involved in signalling between cells of the immune system?

a) interleukins b)interferon c)cytokine d)both a and b

55. The interleukin IL-4 targets

a)activated B cells b)T cells c)endothelium **d)all the above**

56. When the cytokine binds to the receptor of a nearby cell and produces altered gene expression, the action is called

a) autocrine **b) paracrine** c)endocrine d)redundancy

57. Interleukins are synthesized by

a) helper CD4 T lymphocytes b)B cells c)cytotoxic T cells d)Memory cells

58. The action of a single type of cytokine on different types of cells is called

a) Pleiotropy b)redundancy c)antagonism d)synergy

59. Interferons kills

a) bacteria b)fungus **c)viruses** d)all of these

60. Interferon α is used for the treatment of

a) Hepatitis B b)Hepatitis C **c)both a and b** d)leukemia

61. The graft that is placed within the same individual is called

a) allograft b)isograft**c)autograft** d)xenograft

62. The transfer of tissue between two genetically distinct members of the same species is called

a) isograft **b) allograft** c)xenograft c)autograft

63. In which transplant, the organ is divided between two individuals?
a) autograft b) allograft **c) split transplant** d) domino transplants
64. Which rejection begins as early as one week after the transplant, the risk being highest in the first three months?
a) hyperacute **b) acute** c) chronic d) none of these
65. The first successful kidney transplant takes place in the year
a) 1950 b) 1956 c) 1970 d) 1974
65. The cancer arising from epithelium tissue such as glands, breast, skin and linings of the urogenital, digestive and respiratory system is called
a) sarcoma **b) carcinoma** c) leukemia d) lymphoma
66. The cells that are unique to tumor cells and do not occur on normal cells in the body is called
a) Tumor-specific antigens b) Tumor-associated transplantation antigens c) both a and b d) none of these
67. Traditional approaches to treat cancer are
a) surgery b) radiation c) chemotherapy **d) all of these**
68. Who proposed autoimmunity?
a) Paul Ehrlich b) Louis Pasteur c) Edwin Jenner d) Robert Hook
69. Paul Ehrlich first proposed the term auto immune diseases in
a) 1904 b) 1905 c) 1906 **d) 1901**
70. The disease named Addison's disease affects
a) spine **b) adrenal cortex** c) veins d) kidneys and lungs
71. Dermatomyositis is a disease that affects
a) skin **b) muscle** c) nails d) hair
72. Multiple Sclerosis is an autoimmune disease that affects
a) brain b) spinal cord **c) both a and b** d) medulla
73. When the acetylcholine produced from the nerve cells doesn't bind to the muscle cell receptor because of the presence of auto antibodies, the activation of muscle cells are
a) inhibited b) regained c) both a and b d) none of these

74. X-linked Agammaglobulinemia is due to

a) T-cell defect **b)B-cell defect** c)over production of T-cell d)over production of B-cell

75. Individuals with XLA have

a)no peripheral B-cell b)peripheral B-cell c)no peripheral T-cell d)peripheral T-cell

76.Which is the other name for Agammaglobulinemia?

a) XLA b)hypogammaglobulinemia c)Bruton's agammaglobulinemia

d)all of these

77. X-linked agammaglobulinemia is due to the

a) lowIgG levels b)low IgA levels c)high IgG levels d)high IgA levels

78. XLA was discovered in

a)1954 b)1965 **c)1952** d)1970

79. The test for HIV is

a) ELISA b)western blot c)PCR **d)all of these**

80. Progression of HIV is measured by

a) CD4+ count b)viral load **c)both a and b** d)none of these

81. The first vaccination was given by

a) Edwin Jenner b)Louis Pasteur c)Robert brown d)Robert Hook

82. The antigenic preparation of microorganisms such as bacteria, virus or their products administered for prevention or treatment of infectious diseases is called

a) toxin **b)vaccine** c)toxoids d)both a and c

83. The vaccine created by reducing the virulence and harmful effects of a pathogen is called

a) subunit vaccine **b)attenuated vaccine** c)killed vaccine d)DNA vaccine

84. Examples of DNA vaccine are

a) bird flu DNA vaccine b)Veterinary DNA vaccine c)Multiple Sclerosis vaccine **d)all of these**

85. The vaccines that are prepared from the polysaccharide or protein units of bacteria is called

a) Recombinant vaccine b)Toxoid vaccine **c)Sub-unit vaccine** d)cellular vaccine

86. The interaction between antibody and a particulate antigen results in visible clumping is called

a) **agglutination** b) precipitation c) complementation d) neutralisation

87. Agglutination is the reaction between an appropriate antibody and an

a) soluble antigen b) **insoluble antigen** c) both a and b d) none of these

88. Tube agglutination test is also called as

a) standard agglutination test b) serum agglutination test c) **both a and b** d) none of these

89. The process of converting precipitating test to an agglutinating test is called

a) slide agglutination test b) tube agglutination test

c) **passive agglutination test** d) haemagglutination test

90. One of the properties of some antibody classes is the ability to precipitate from solution when combined with multivalent antigens can be visualized is called

a) opsonisation b) **precipitation** c) agglutination d) neutralisation

91. The process in which the antibody is incorporated into the agar gell and then the antigens are loaded on the well is called

a) **RID** b) ODD c) immunoelectrophoresis d) rocket electrophoresis

92. In ODD, the antibodies in the antiserum react with more than one of the antigens than the other is called the line of

a) identity b) non-identity c) **partial identity** d) none of these

93. The process which combines electrophoresis and double immunodiffusion is called

a) **immunoelectrophoresis** b) ODD c) RID d) ELISA

94. In rocket electrophoresis, which antigen is electrophoresed in gel containing antibody?

a) **negatively charged** b) positively charged c) neutral charge d) none of these

95. In counter-current electrophoresis, the antigen-antibody should have

a) **opposite charges** b) same charges c) negative charges d) positive charges

96. Immunofluorescence is a technique given by

a) Edwin Jenner b) Karl Landsteiner c) **Albert Coons** d) Robert Hook

97. Immunofluorescence is brought in the year

a) 1955 b) 1976 c) 1965 **d) 1944**

98. An organic dye that is most widely used for immunofluorescence is called

a) phycoerythrin b) rhodamine **c) fluorescein** d) all the above

99. In secondary immunofluorescence, it uses

a) 2 antibodies b) 3 antibodies c) 1 antibody d) 4 antibodies

100. In primary immunofluorescence, it uses

a) single antibody b) 2 antibodies c) 3 antibodies d) 4 antibodies

FIVE MARKS:

1. Differentiate between Innate and adaptive immunity?
2. Write about the humoral immunity?
3. Write short notes on Tc cells?
4. Write a note on development of B-cells?
5. Define clonal expansion.
6. Write a note on primary lymphoid organs?
7. Give a note on Inflammatory barriers.
8. Explain the immunological functions of spleen?
9. Describe MALT and its functions?
10. Give a note on production of plasma and memory cells.
11. Describe the basic structure of immunoglobulins?
12. Describe the essential features of antigen?
13. Write a note on antigenic determinants on immunoglobulins?
14. Explain hapten with suitable examples?
15. Write an account on biological functions of antibody?
16. Write a note on the properties on B-cell epitope?
17. Explain the types of adjuvants?
18. Define HLA typing.

19. Give a note on IgG and its functions?
20. Write a note on class I MHC?
21. Define classical pathway of complement biology?
22. Define complement proteins and its biological functions?
23. Write a note on cytokines and its action?
24. Give an account on type I hypersensitivity?
25. Give a brief note on immunological tolerance?
26. What is immuno suppression and its mechanism of suppression?
27. Define interleukins and its functions?
28. Define the role of cytokines in immune responses?
29. Explain type III hypersensitivity reactions?
30. Give an account on interferons?
31. What is transplantation? Explain its types.
32. Write a note on Tumour escape mechanisms?
33. What are the different types of transplantation rejection and explain?
34. Give a short note on autoimmunity?
35. Define immunodeficiency and some examples?
36. Give an account on AIDS?
37. Write a note on Tumour antigens?
38. Define graft versus host.
39. Write a note on transplantation reactions.
40. Give a note on general immune response to infectious diseases.
41. Define vaccines and its types?
42. Write short notes on production of monoclonal antibodies?
43. Define Radio immuno assay?
44. What is immunoblotting? Explain with an example.
45. Give an account on Haemagglutination.

46. Give short notes on rocket and countercurrent immunoelectrophoresis.
47. Explain complement fixation test with example.
48. Give short note on primary immunofluorescence?
49. Define DNA vaccines and its uses?
50. Write short notes on immunosurveillance mechanisms?

EIGHT MARKS:

1. Give a brief note on the history of immunology?
2. Write an essay on the various phenomena of innate immunity?
3. Write about B-cell activation and its functions?
4. Discuss the organisation of the immune system?
5. Describe haematopoiesis and development of T lymphocytes?
6. Give a brief note on secondary immune response?
7. Write about the cells of the immune system?
8. Write a note on cell mediated immunity?
9. Give a detailed account on B-cell maturation?
10. Write a note on role of T_H cell in B-cell activation?
11. Give detailed account on MHC-structure and function?
12. Write a brief account on CD markers?
13. Describe cross-reactivity?
14. Define antibody and its types and functions?
15. Explain the processing and presentation of endogenous antigens?
16. Write a brief note on epitope and its properties?
17. Give a detailed account on adjuvants?
18. Describe the types of Antibodies?
19. Give a brief account of the essential factors for antigenicity?
20. Give an account on antigen-antibody reaction?

21. Give an account on the alternate pathway of the complement system?
22. What is hypersensitivity? Classify it with an example.
23. Give an account on the immune complex mediated hypersensitivity?
24. Give an account on the delayed type hypersensitivity?
25. Describe tolerance and immune suppression?
26. Write a brief note on immune suppressive drugs?
27. Describe cytokines and explain its action on WBC?
28. Describe Interleukins and Interferons along with its functions?
29. Describe the classical and alternative pathway of complement system?
30. Write a note on cytokine receptors and signalling?
31. Write a detailed account on transplantation immunology?
32. Explain X-linked agammaglobulinemia.
33. Explain AIDS with its structure.
34. Write a detailed note on auto-immunity?
35. Explain Tumour immunology with suitable diagrams?
36. Give a detailed note on immune response to bacterial diseases?
37. Write a brief note on tumour antigens and its regulation?
38. Give a detailed note on immune response to viral diseases?
39. Explain some of the immuno deficiency diseases?
40. Explain the detailed note on transplantation reactions?
41. What is precipitation? Describe the immunological technique designed on the principle of precipitation.
42. What is radioimmunoassay? Describe the procedure and its applications.
43. What is agglutination? Describe the typing of ABO and Rh blood grouping.
44. What is agglutination? Explain the different techniques.
45. Give an account on ELISA?
46. Give an account on immunofluorescence?

47. Explain monoclonal antibodies and its applications?
48. Define Attenuated and sub-unit vaccines?
49. Define DNA vaccines and its applications?
50. What is immunoblotting and explain northern and southern blotting?

MICROBIOLOGY

UNIT-1

ONE MARKS

1. Which following feature describes the Pandora Virus?

- a) Largest virus
- b) Smallest virus
- c) **Largest viral genome**
- d) Smallest viral genome

2. Who discovered Archaeobacteria?

- a) **Carl woese**
- b) Edelman
- c) Ehrlich
- d) Pasteur

3) When rod shaped bacteria appears to be in pair arrangement it is termed as

- a) staphylococci
- b) bacillus
- c) **diplobacilli**
- d) streptobaccili

4) Majority of bacteria possesses a unique macromolecule known as

- a) glycan
- b) glycogen
- c) **peptidoglycan**
- d) peptoglycan

5) Myxo used in name of Orthomyxoviruses refers to affinity of virus towards

- a) **Mucins**
- b) Mucans

c) Mutation

d) Mixed phenotype

6) Which of the following is the comma shaped bacteria?

a) Sarcina

b) Bacilli

c) **Vibrio**

d) Spirilla

7) Which type of bacteria prepare their own food by utilization of solar energy?

a) Bacteria

b) Autotropic Bacteria

c) Tetracoccus bacteria.

d) Diplococcus bacteria

8) Which of the following bacteria has no flagella?

a) Amphitrichous

b) Peritrichous

c) Lophotrichous

d) Atrichos

9) The Iodine used in Gram Staining is used as a

a) Chelator

b) Catalyst

c) **Mordant**

d) Cofactor

10) Which of the following group of bacteria is considered as a link between bacteria and virus?

a) Mycoplasma

b) Actinomycetes

c) Spirochaetes

d) Vibrio

11) A very dormant and thick walled structure which is produced by direct fusion of hyphae are called

- a) basidiospore
- b) **zygospore**
- c) spores
- d) ascospore

12) Which are the most primitive group of Algae?

- a) **Blue green Algae**
- b) Red Algae
- c) Brown Algae
- d) Green algae

13) Kelps is obtained from

- a) Algae
- b) **Marine Algae**
- c) Aquatic Algae
- d) Lichens

14) Heterocysts are

- a) Green and Thick walled
- b) Green and Thin walled
- c) Colourless and Thick walled
- d) **Colourless and Thin walled**

15) Cephaleoures is a

- a) An epiphytic green algae
- b) **A fresh water green algae**
- c) A parasitic green algae
- d) A colourless green algae

16) 'Bacilli' is term used for

- a) Round bacteria
- b) Spiral bacteria
- c) **Rod shaped bacteria**
- d) Cluster shaped bacteria

17) A 'polysaccharide' that helps bacteria in adherence to surface is named as

- a) Granule
- b) **Glycocalyx**
- c) Mesosome
- d) Nucleoid

18) 'Flagellum' is made up of

- a) Sugars
- b) Lipids
- c) Polysaccharides
- d) **Proteins**

19) Gap between outer membrane and plasma membrane is named as

- a) Mesoderm
- b) Metaderm
- c) Plasma
- d) **Periplasma**

20) Circular, double-stranded and extrachromosomal DNA, can replicate independently of bacterial chromosome, called as

- a) **plasmid**
- b) Cosmic
- c) Vector
- d) template

FIVE MARKS

- 1) Write a brief note on history of microbiology.
- 2) Illustrate the ultra structure of bacteria.
- 3) Classify bacteria based on Bergey's classification.
- 4) Write the classification of bacteria according to modern classification.

- 5) Write a note on classification of algae.
- 6) Give a brief account on classification of fungi.
- 7) Describe the classification of virus based on Baltimore's classification.
- 8) Write short note on microbiology.
- 9) Describe the functions of prokaryotes.
- 10) Differentiate between gram positive and gram negative bacteria.

EIGHT MARKS

- 1) Define microbiology. Give a brief note on history of microbiology.
- 2) Sketch the fine structure of bacteria and list out its functions.
- 3) Draw a neat diagram of ultra structure of prokaryotes and explain its parts.
- 4) Write a detailed note on general classification of bacteria as in Bergey's classification.
- 5) Based on modern classification write down the classification of bacteria.
- 6) Explain the classification of fungi in detail.
- 7) Give a brief note on classification of virus according to Baltimore's classification.
- 8) Write a brief note on classification of algae.
- 9) Describe cell wall with a neat diagram.
- 10) Write a detailed account on stages of endospore development.

UNIT-2

ONE MARKS

1) Which one of the following is true

- a) Agar has nutrient properties
- b) Chocolate medium is selective medium
- c) Addition of selective substances in a solid medium is called enrichment media
- d) Nutrient broth is basal medium**

2) Tyndalization is a type of

- a) Dry heat
- b) Intermittent Sterilization**
- c) Boiling
- d) Pasteurization

3) Autoclaving is a type of

- a) Dry heat
- b) Moist heat**
- c) Pasteurization
- d) Intermittent sterilization

4) Pore size of 'nitrocellulose' is

- a) 0.40 μm
- b) 0.22 μm**
- c) 2.21 μm
- d) 1.26 μm

5) Each of the following statements concerning the Gram stain is correct except:

- a. Escherichia coli stains pink because it has a thin peptidoglycan layer
- b. Streptococcus pyogenes stains blue because it has a thick peptidoglycan layer
- c. Mycoplasma pneumoniae is not visible in the Gram's stain because it does not have a cell wall
- d. Mycobacterium tuberculosis stains blue because it has a thick lipid layer**

6) For accurate colony count calculation, the range must be

- a) 40-200
- b) 30-500
- c) 30-300**
- d) 50-500

7) Which plating technique might kill heat-sensitive bacteria?

- a) Pour plate technique**
- b) Spread plate technique
- c) streak plate technique
- d) None of the above

8) Fungi can be stained by

- a) Saffranine
- b) Cotton blue**
- c) Glycerine
- d) crystal violet

9) Fungi can be distinguished from algae in the fact that

- a) cell wall is cellulose and chlorophyll is absent
- b) Nucleus is present
- c) Mitochondria is absent
- d) Cell wall is chitinous and chlorophyll is absent**

10) Which of the following is not a natural stain?

- a) Brazilin
- b) Carmine
- c) Hematoxylin
- d) Safranine**

11) Which of the following is used in gram staining?

- a) Hematoxylin
- b) Acetocarmine
- c) Rhodamine
- d) Crystal Violet**

12) Which of the following is a common nuclear stain?

- a) Safranine
- b) Erythrosine
- c) Hematoxylin**
- d) Fast green

13) Carmine is obtained from

- a) Plants
- b) Fungus
- c) Insects**
- d) Bacteria

14) Which is the stain commonly used in electron microscopy?

- a) Ethidium bromide
- b) osmium tetroxide**
- c) Bismark brown
- d) Nile green

15) Which of the following is a protein specific fluorescent dye?

- a) DAPI
- b) Acrydine Orange

c) **Rhodamine**

d) Ethidium bromide

16) Which of the following is good for staining proteins?

a) DAPI

b) EtBr

c) **Coomasie Blue**

d) Crystal violet

17) Lipids are commonly stained using

a) Fast green

b) Orange G

c) **Sudan Stain**

d) Crystal violet

18) How does UV kill microbes?

a) Denatures protein

b) Forms Thymine Dimers

c) Denatures Lipids

d) Stops membrane transport

19) Which of the following is a cytoplasmic stain?

a) Fast green

b) Sudan

c) **Eosin**

d) Orange G

20) Lyophilization involves

a) Freezing the product

b) Lowering the pressure

c) Sublimation of ice

d) All the above

FIVE MARKS

- 1) Write a short note on bacterial staining.
- 2) Give a brief account on fungal staining.
- 3) What are the preservation methods used in culture preparation? Write a short note on it.
- 4) What is culture media? List out its types.
- 5) Describe the types and preparation of culture media.
- 6) Write a brief note on isolation methods of culture.
- 7) Write about the maintenance of pure culture.
- 8) Write down the sterilization techniques used in culture preparation.
- 9) Describe the dry heat and moist heat sterilization methods.
- 10) Write a note on culture methods.

EIGHT MARKS

- 1) Define culture media. Write a detailed account on its types and preparation.
- 2) Explain briefly about the sterilization methods of culture media.
- 3) Describe the culture methods in detail.
- 4) Write a brief note on preservation methods of culture media.
- 5) Give a detailed account on bacterial account on bacterial staining.
- 6) Explain the fungal staining methods.
- 7) Give a brief note on radiation and filtration of sterilization methods.

8) Explain the maintenance of pure culture.

9) Compare and contrast the bacterial staining and fungal staining methods.

10) Write a detailed note on spread plate, streak plate and pour plate.

UNIT-3

ONE MARKS

1) Generation time is

- a) time required for the population to double
- b) time required for the initial adaptation
- c) obtained by the expression, t/n , where t = time and n = number of generation
- d) both a and c**

2) The term facultative anaerobe means

- a) Doesn't use oxygen but can tolerate it
- b) Is killed by oxygen
- c) Uses oxygen when present or grows without oxygen when its absent**
- d) Requires less oxygen than present in air

3) The micro-organisms that grow best in low -oxygen environment are termed

- a) Aerobe
- b) Anaerobe
- c) Facultative
- d) Microaerophile**

4) Exponential phase of growth curve of bacteria is of limited duration since

- a) Rise of cell density
- b) Accumulation of toxic metabolites
- c) Exhaustion of nutrients
- d) All the above**

5) Micro-organisms that use Carbon Dioxide as their sole source of carbon are termed

- a) **Autotrophs**
- b) Heterotrophs
- c) Chemotrophs
- d) Lithotrophs

6) An organism that's completely dependant of atmospheric oxygen for survival is termed

- a) Osmotolerant
- b) Acidophile
- c) Facultative anaerobe
- d) **Obligate Aerobe**

7) The period between inoculation of bacteria in culture media and start of multiplication is known as

- a) Log phase
- b) **Lag phase**
- c) Exponential phase
- d) Stationary phase

8) The term Obligate anaerobe refers to an organism that

- a) doesn't use oxygen but tolerates it
- b) **is killed by oxygen**
- c) uses oxygen when present and grows without oxygen when its absent
- d) prefers to grow without oxygen

9) Haemocytometry can be done using

- a) Haemocytometer
- b) Electronic cell counter
- c) **Both a and b**
- d) None of the above

10) Increased levels of white blood cells in blood is termed as

- a) Erythropoiesis
- b) Leukocytopenia
- c) Leucocytosis**
- d) Polycythemia

11) Which of the following is not an indication of Leukocytopenia?

- a) Bone marrow depression
- b) Megaloblastic anemia
- c) Microbial infection
- d) Leukemia**

12) An experiment started with 4 cells and ended with 128 cells. How many generations did the cell go through?

- a) 3
- b) 4
- c) 5
- d) 6**

13) What is the generation time for E. coli in optimal laboratory conditions?

- a) 20 mins**
- b) 1 day
- c) 3 days
- d) 10 hours

14) What is the generation time for E. Coli in vivo?

- a) 20 mins
- b) 1 day**
- c) 40 mins
- d) 2 hours

15) The average time between two consecutive generations of a (bacterial) population is known as

- a) Population time
- b) Generation doubling time
- c) Generation time**
- d) Population explosion

16) Haemocytometry is done to

- a) To find out normal/abnormal count of cells
- b) To support/confirm clinical diagnosis of the patient
- c) To find out the response of a patient to the treatment
- d) All the above**

17) Which of the following cell counting chambers as originally designed for counting cells in the CSF?

- a) Fuch's Rosenthal chamber**
- b) Burker counting chamber
- c) Old Neubauer Chamber
- d) Improved Neubauer Chamber

18) Turk's Solution is used in Haemocytometry for the counting of

- a) RBCs
- b) WBCs**
- c) Platelets
- d) All blood cells

19) Hayem's solution is used as a diluting factor for

- a) RBCs**
- b) WBCs
- c) Platelets
- d) All blood cells

20) Taking a culture and keeping it in 80 degree Celsius eventually gives a stable weight. This weight is the

- a) Total cell count
- b) Dry weight of the cells in the sample**
- c) Generation time
- d) Weight of the cell metabolite

FIVE MARKS

- 1) Define bacteria. Write a note on nutritional requirement of bacteria.
- 2) Discuss the nutritional type of organisms.
- 3) Describe microbial growth with the help of growth curve.
- 4) Write a note on colony count.
- 5) Explain growth curve and mention its significant.
- 6) Explain the measurement of microbial growth.
- 7) Write short note on packed cell volume.
- 8) Write short note on haemocytometry.
- 9) Explain-Turbidometry.
- 10) What is dry weight. Mention its function.

EIGHT MARKS

- 1) Write a detailed account on nutritional requirement of bacteria.
- 2) Explain briefly about the nutrition types of microorganisms.
- 3) Write a brief note on microbial growth.
- 4) Describe microbial growth with the help of growth curve.
- 5) Explain growth curve. Mention its uses and significance.
- 6) Give an account on measurement of microbial growth.
- 7) Write a note on colony count and dry weight in detail.

8) Explain briefly on packed cell volume.

9) What is haemocytometry. Mention its function and uses.

10) Give a detailed account of haemocytometry and turbidometry.

6) The test which estimates the number of fecal coliforms in a water sample is

- a) ELISA test
- b) MPN test**
- c) MVP test
- d) Widal test

7) MPN test is based on

a) Degree of lactose fermentation in the sample

- b) Amount of toxins released from the sample
- c) Degree of Glycolysis in the sample
- d) None of the above

8) The general pore size of membrane filters is

- a) 0.45 μm**
- b) 0.05 μm
- c) 1.5 mm
- d) 0.5 mm

9) The Vibrio infection that can lead to blood poisoning and death in many cases is caused by

- a) Vibrioparahemolyticus
- b) Vibrio vulnificus**
- c) Both of the above
- d) None of the above

10) The main mode of vibrio transmission in food is through

- a) Raw oysters**
- b) Raw fish
- c) Raw poultry
- d) Raw meat

11) A venereal infection in cattle and sheep causing infertility is

- a) Vibrioparahemolyticus **b) Vibrio fetus**
c) Vibrio vulnificus d) None of the above

12) The effect of two microbes working together that is greater than the effect of either acting alone is

- a) Commensalism b) Asymbiosis
c) **Synergism** d) Predation

13) A relationship in which one of the symbiotic species lives inside the tissue the other is

- a) Asymbiosis b) Synergism
c) Predation d) Endosymbiosis

14) The floating and drifting microbes are called

- a) **Planktons** b) Benthos
c) Limnos d) None of these

15) The major Clostridium Species found in pollutes regions of oceans is

- a) **C. oceanicum** b) C. marinine
c) C. subtilis d) None of the above

16) Major Faecal contaminant in potable water

- a) E. Coli b) Streptococcus faecalis
c) **Both a and b** d) None of the above

17) IMViC test is carried out to differentiate the presence of

a) E.Coli from Clostridium

b) E.Coli from Enterobacter aerogenes

c) E.Coli from Streptococcus

d) E. Coli from other bacteria

18) High BOD indicates

a) More microbes in water

b) Less microbes in water

c) Less polluted water

d) Fresh water

19) Aggregates of microbes in as tiny masses in activated sludge process are known as

a) Activated Sludge

b) Masses

c) Colliodal masses

d) Floccules

20) BOD levels of 3-8mg/l in a lake signifies that the lake is

a) Least polluted

b) Moderately polluted

c) Highly polluted

d) Very clean

FIVE MARKS

1)Write a note on nutralism and its role in microbiology

- 2) Describe- mutualism and its function.
- 3) Write an account on role of synergism in microbiology.
- 4) What is water pollution? And explain its significance.
- 5) Explain- symbiosis and Asymbiosis and write its role.
- 6) Explain – water borne diseases with examples.
- 7) Write a note on ammensalism.
- 8) Write a brief note on Membrane Filtration Technique.
- 9) Explain – MPN test and write its uses.
- 10) Explain-briefly on Vibriosis.

EIGHT MARKS

- 1) Give a detailed account on water borne diseases and write its role on vibriosis.
- 2) Give a brief account on water pollution.
- 3) Explain briefly on symbiosis and asymbiosis and mention its significance.
- 4) Discuss the role of ammensalism and commensalism in microbial interaction.
- 5) Give a detailed account on synergism.
- 6) Give a brief account on bacteriological examination of water.
- 7) Give an account of Membrane Filtration Technique.
- 8) Write the steps to progress MPN test.
- 9) Give an account of mutualism in detail.
- 10) Explain Vibriosis and write its role.

Unit-5

ONE MARKS

1) The major carrier of Salmonellosis is

- a) **meat and eggs**
- b) meat and fish
- c) eggs and fish
- d) eggs and fruits

2) Which of the following are true regarding Staphylococcus food poisoning?

- a) It is an enterotoxin
- b) It causes Gastroenteritis
- c) It is caused by Staphylococcus aureus
- d) All of the above**

3) Which following disease is not caused by a virus

- a) tetanus**
- b) measles
- c) chicken pox
- d) poliomyelitis

4) The following is not a mosquito borne disease

- a) Malaria
- b) Dengue fever
- c) yellow fever
- d) Viral fever**

5) The following disease are caused by virus except

- a) Hepatitis-B
- b) Influenza
- c) Rabies
- d) Scabies**

6) The following are water-borne diseases except

- a) Cholera
- b) Typhoid
- c) Hepatitis-B
- d) Measles**

7) Polio vaccine was discovered by

- a) Frederick banting
- b) Louis pasteur
- c) Jonas salk**
- d) Eli whitney

8) A bacterial disease with oral manifestations is

- a) Herpes
- b) Measles
- c) Diphtheria**
- d) Leishmaniasis

9) Aspergillosis occurs in

- a) People exposed to Aspergillus spores
- b) People with immune deficiency**
- c) Obese people
- d) None of the above

10) The most identified Aspergillus species is

- a) **A. fumigatus**
- b) A. acidus
- c) A. affinis
- d) A. ambiguous

11) In diagnosis, the type of stain used for Aspergillus is

- a) Acidic stains
- b) **Silver stains**
- c) Oil stains
- d) Basic stains

12) In diagnosis of Typhoid, if the test is positive for O antigen and negative for H antigen, the inference is

- a) Presence of typhoid infection
- b) No infection
- c) **Presence of some other infection but not S. Typhi**
- d) None of the above

13) Widal test is the diagnostic test for

- a) **Typhoid**
- b) Styphylococcosis
- c) Candidiasis
- d) HIV

14) Which of the following is characterized by continuous fever?

- a) **Typhoid**
- b) Dengue
- c) Brucellosis
- d) Malaria

15) Which of the following is characterized by intermittent fever?

- a) Typhoid
- b) Dengue**
- c) Meningitis
- d) lobar pneumonia

16) White patches on the tongue is a symptom of

- a) HIV infection
- b) Staphylococcosis
- c) Pneumonia
- d) Candidiasis**

17) Candidiasis is most commonly caused by

- a) *C. gabrata*
- b) *C. krusei*
- c) *C. albicans***
- d) *C. Antarctica*

18) Occasional disinfection of mouth by mouthwash is used to prevent

- a) Candidiasis**
- b) pneumonia
- c) Typhod
- d) Malaria

19) Tobacco Mosaic Virus contains

- a) Single-stranded DNA
- b) Double-standed DNA
- c) Single-stranded RNA**
- d) Double-stranded RNA

20) Which is the most common isolate recovered from clinical cases of staphylococcosis?

- a) *S. aureus***
- b) *S. hyicus*
- c) *S. gallinarium*
- d) *S. epidermidis*

FIVE MARKS

- 1) Write an account on prophylaxis of typhoid.
- 2) Write short note on TMV.
- 3) What is HIV? Write its symptoms and diagnosis.
- 4) What are microbial diseases? And mention its role.
- 5) Explain –briefly on Influenza Virus.
- 6) Write short note on Dengue fever.
- 7) Describe the pathogenesis of microbial disease.
- 8) Write a note on Dengue fever.
- 9) Describe shortly on candidiasis.
- 10) Explain –Aspergilliosis and its importance.

EIGHT MARKS

- 1) Write a brief account on pathogenesis of microbial disease.
- 2) List out the causative agents, symptoms and diagnosis of microbial diseases.
- 3) Write a detailed account on TMV
- 4) Explain –causative agent, symptoms, diagnosis and treatment of HIV?
- 5) Give a brief note on Influenza virus.
- 6) Write an account on prophylaxis of typhoid.
- 7) What is the role of candidiasis in microbiology?

8) Explain staphylococcosis with a neat diagram.

9) Explain –Aspergilliosis and write its role.

10) Write an account on Aspergilliosis and candidiasis and write its function.

MOLECULAR BIOLOGY- 16UBT507 (III B.Sc)

SECTION-A

Choose the correct answer (1 Mark)

UNIT-1

1. The central dogma of molecular biology
(a) **DNA-RNA-Protein** (b) RNA-DNA-Protein (c) Protein-DNA-RNA (d) RNA-Protein-DNA
2. Genetic code translated the language of
(a) **Amino acids into that of RNA** (b) Proteins into that of RNA (c) RNA into that of DNA (d) RNA into that of Proteins
3. The number of non-sense codons is
(a) 2 (b) **3** (c) 4 (d) 5
4. UAA is known as
(a) OPAL (b) Amber (c) **Ochre** (d) Umber
5. UAG is known as
(a) OPAL (b) **Amber** (c) Ochre (d) Umber
6. UGA is known as
(a) **OPAL** (b) Amber (c) Ochre (d) DNA
7. Except _____ each amino acid has multiple codons
(a) Tryptophan (b) Methionine (c) Arginine (d) **Both a and b**
8. Inosine of anticodons can pair with any of _____
(a) U (b) C (c) A (d) **All the above**
9. The initiator protein for DNA replication is
(a) **DNA AA TP** (b) DNA B (c) Gyrase (d) Primase
10. Ligase joins the nicks by creating
(a) Covalent bond (b) **Phosphodiester bond** (c) Hydrogen bond (d) Ionic bond
11. Formation of nucleotides of a newly synthesized strand in DNA replication, _____ is required
(a) RNA polymerase (b) **DNA polymerase** (c) Ligase (d) RNA primer
12. _____ is required for tension relaxation
(a) **Gyrase** (b) Helicase (c) Ligase (d) SSB protein
13. _____ is involved in proof reading mechanism
(a) DNA polymerase I (b) DNA polymerase II (c) **DNA polymerase III** (d) RNA polymerase II

14. _____ is required for primer removal
 (a) **DNA polymerase I** (b) DNA polymerase II (c) DNA polymerase III (d) RNA polymerase II
15. _____ is required for strand stability
 (b) Gyrase (b) Helicase (c) Ligase (d) **SSB protein**
16. _____ is required for unwind helix
 (c) Gyrase (b) **Helicase** (c) Ligase (d) SSB protein
17. _____ is required for nick translation
 (d) Gyrase (b) Helicase (c) **Ligase** (d) SSB protein
18. Gyrase is come under
 (a) **Topoisomerase** (b) SSB protein (c) Helicase (d) Polymerase
19. _____ is required for primer synthesis
 (e) Gyrase (b) Helicase (c) Ligase (d) **primase**
20. The role of replicase enzyme is needed for
 (a) ssDNA (b) **ssRNA** (c) dsRNA (d) dsDNA

UNIT-2

21. In mutational event, when adenine is replaced by guanine, it is case of
 (a) Transition (b) Transcription (c) Transversion (d) **Frameshift mutation**
22. Which of the following has the self-repairing mechanisms?
 (a) DNA and RNA (b) DNA and RNA (c) **Only DNA** (d) DNA and proteins
23. Alteration in a nucleotide sequence which change codon to a termination codon is
 (a) **Non-sense mutation** (b) Mutagenesis (c) Mutation (d) Mutants
24. The enzyme photolyase is used in _____ repair
 (a) Base excision (b) **Photo reactivation** (c) Nucleotide excision (d) None of these
25. Which of the following dimer is most common
 (a) **Thymidine dimer** (b) adenine dimer (c) Cytidine dimer (d) Guanidine dimer
26. Dimer repair mechanism include
 (a) Excision (b) Photo reactivation (c) Recombinational (d) **All the above**
27. Which of the following is dark repair?
 (a) Nucleotide excision repair (b) Base excision repair (c) **Both a and b** (d) None of the above
28. DNA polymerase involved in base excision repair is
 (a) **Polymerase β** (b) Polymerase σ (c) Polymerase λ (d) Polymerase α

29. Which of the following is bypass repair mechanism?
 (a) BER (b) **SOS** (c) NER (d) Recombinational repair
30. DNA repair mechanism is absent in
 (a) Nuclear genome (b) Mitochondrial genome (c) Chloroplast genome (d) **Both b and c**
31. Umu C, umu D gene families and Rec A protein are involved in
 (a) BER (b) NER (c) **SOS** (d) Recombinational repair
32. DNA helicase involved in base excision repair is
 (a) I (b) II (c) **III** (d) IV
33. The first DNA glycosylase discovered is
 (a) **Uracil** (b) Adenine (c) Thymine (d) Methyl adenine
34. The function of Uvr C in nucleotide excision repair is
 (a) To identify lesion in DNA (b) Helicase activity (c) Catalyse incision at 3' end of lesion (d) **Catalyse incision at 5' end of lesion**
35. The activity of AP endonuclease activity is involved in
 (a) **BER** (b) NER (c) Mismatch (d) Double strand break repair
36. In mismatch repair mechanism, endonuclease activity which cuts nascent DNA strand is done by
 (a) **Mut H** (b) Mut L (c) Mut S (d) Uvr D
37. Which is not involved in mismatch repair mechanism in bacteria
 (a) **Mut A** (b) Mut L (c) Mut S (d) Uvr D
38. In mismatch repair mechanism, which of the protein recognize DNA mismatches in genomic DNA
 (a) Mut H (b) Mut L (c) **Mut S** (d) Uvr D
39. The enzyme photolyase repair the thymidine dimer in DNA by
 (a) Oxidation mechanism (b) **Free radical mechanism** (c) Direct bond breaking (d) Adduct formation
40. Two chromophores present in photolyase enzyme are
 (a) NAD and FAD (b) FAD and Folate (c) FADH and Folate- (d) **FAD- and Folate**

UNIT-3

41. The promoter recognition factor for RNA polymerase is
 (a) α (b) β (c) σ (d) β^1

42. The core promoter region for prokaryotic transcription is
(a) GA box (b) SD sequence (c) CAAT box (d) **TATA box**
43. In prokaryotes, protein release factor RF1 recognises_____ codons
(a) UAG (b) UGA (c) UAA (d) **Both a and c**
44. In prokaryotes, post transcription modification is needed for
(a) tRNA (b) mRNA (c) rRNA (d) **Both a and c**
45. The involvement of Rut site has to be found in prokaryotic transcription
(a) initiation (b) **termination** (c) elongation (d) none of the above
46. Molecular chaperones plays a role in
(a) protein folding (b) protein degradation (c) protein export (d) **All the above**
47. TATA box is otherwise called as
(a) Core promoter (b) pribnow box (c) Goldberg-hogness box (d) **All the above**
48. RNA polymerase involved in prokaryotic transcription is
(a) Versatile enzyme (b) Holoenzyme (c) Multimeric protein (d) **All the above**
49. -35 sequence is otherwise called as
(a) CAAT box (b) SD sequence (c) **GA box** (d) Weak promoter
50. Bacterial ribosomes contains_____ kinds of rRNA
(a) 4 (b) **3** (c) 5 (d) 2
51. The translational initiation factor which prevents the association of 50S and 30S subunits is
(a) IF1 (b) IF2 (c) **IF3** (d) IF4
52. The elongation factor involve in translocation of mRNA is
(a) **EF-G** (b) EF-TU (c) EF-TS (d) EF-S
53. Post translation modification is categorised as
(a) Protein folding (b) Proteolytic cleavage (c) Covalent attachment (d) **All the above**
54. 26S proteasome complex contains_____enzymes for ubiquitination
(a) 4 (b) **3** (c) 5 (d) 6

55. Post translational mode of protein export depends on
(a) Sec A (b) Sec B (c) SRP (d) **Both a and b**
56. _____ helps in the translocation of folded form of protein
(a) SecA (b) DNA J (c) DNA K (d) **Both b and c**
57. Protein export happens through
(a) Sec YEG (b) Yid C (c) SRP (d) **Both a and b**
58. _____ plays a major role in translational initiation
(a) **16S rRNA** (b) 5S rRNA (c) 23S rRNA (d) 28S rRNA
59. Prokaryotic mRNA is
(a) Monocistronic (b) Bicistronic (c) Tricistronic (d) **Polycistronic**
60. *E. coli* contains _____-tRNA molecule
(a) 3 (b) **4** (c) 5 (d) 6

UNIT-4

61. The gene code for β -galactosidase
(a) **Z** (b) Y (c) A (d) Camp
62. The first identified transposon is
(a) IS element (b) **AC/DS element** (c) Copia elements (d) Ty elements
63. Alu sequence belongs to
(a) LINES (b) LTR (c) **SINES** (d) Non-LTR
64. Pribnow box consists of _____ nucleotides
(a) 4 (b) 5 (c) **6** (d) 7
65. GA box consists of _____ nucleotides
(a) **6** (b) 4 (c) 5 (d) 7
66. Transcription start site is seen in
(a) **Core promoter** (b) Proximal promoter (c) Upstream region (d) Downstream region
67. The mutation of consensus sequence causes
(a) Gastric ulcer (b) Huntington's disease (c) Gilbert's syndrome (d) **All the above**
68. CAAT box is seen in
(a) Core promoter (b) Proximal promoter (c) **Upstream region** (d) Downstream region

69. Eukaryotes contains
(a) CAAT box (b) TATA box (c) Distal promoter (d) **Both a and c**
70. CRP, an activator protein present in lac gene of *E. coli* has _____ binding sites
(a) **2** (b) 3 (c) 1 (d) 4
71. Enhancer is seen in
(b) Upstream region (b) Downstream region (c) Coding region (d) **Anywhere**
72. The major component needed for enhancer's function is
(a) Activator (b) Promoter (c) Silencer (d) **DNA bending protein**
73. Silencer has binding site for
(a) Activator (b) Regulator (c) **Repressor** (d) Transcriptional factor
74. Silencer is seen in
(a) **Upstream region** (b) Downstream region (c) Coding region (d) Anywhere
75. Silencer affects gene expression through
(a) **Intron splicing** (b) Affect transcriptional factor (c) GTF assembly (d) **All the above**
76. _____ are the recognition sites for transcriptional factors
(a) Distal elements (b) Regulatory elements (c) **Response elements** (d) Proximal elements
77. Gene expression has been controlled by
(a) Activator (b) Enhancer (c) Repressor (d) **Transcriptional factor**
78. Non-composite transposons contains
(a) Antibiotic resistant gene (b) IR flanking region (c) IS elements (d) **Both a and b**
79. Copia elements are seen in
(a) Bacteria (b) Plants (c) Human (d) **Drosophila**
80. Ty elements are seen in
(a) **Yeast** (b) Plants (c) Human (d) Drosophila

UNIT-5

81. Holliday junction formation happens in
(a) Post synapsis (b) Pre synapsis (c) **Synapsis** (d) Extension
82. Lambda repressor code by
(a) **CI gene** (b) O gene (c) P gene (d) Cro gene
83. Illegitimate recombination =
(a) Homologous (b) **Non – Homologous** (c) Sequence specific (d) Enzyme specific

84. Lambda activator code by
(a) CI gene (b) O gene (c) P gene (d) **Cro gene**
85. Pick out the immediate early gene of lambda phage
(a) **N** (b) Q (c) P (d) L
86. Pick out late gene of lambda phage
(a) L (b) N (c) **Q** (d) P
87. Replication and recombination are due to _____ gene
(a) L (b) **N** (c) Q (d) P
88. Phage assembly and cell lysis are due to _____ gene
(a) L (b) N (c) **Q** (d) P
89. Activation of C1 repressor by _____ gene
(a) O (c) P (d) **CII** (d) N
90. Lambda activator code by
(a) CI gene (b) O gene (c) P gene (d) **Cro gene**
91. M13 phage is a
(a) **Filamentous phage** (b) Temperate phage (c) Spherical phage (d) RNA phage
92. Lambda phage is a
(a) Filamentous phage (b) **Temperate phage** (c) Spherical phage (d) RNA phage
93. COS site is responsible for
(a) **Circularization** (b) Replication (c) Lytic cycle initiation (d) Lysogeny cycle initiation
94. The size of lambda phage is
(a) **4.8kb** (b) 3.6kb (c) 3.2kb (d) 5.2kb
95. The important Recombinase involved in homologous recombination is
(a) Rec B (c) **Rec A** (c) Rec D (d) Rec C
96. Rec A is responsible for
(a) Strand exchange (b) Recognition of single strand 3'end (c) Nucleoprotein complex formation (d) **All the above**
97. Lox site is a recognition site for
(a) Rec A (b) **Cre** (c) Rfx (d) None of the above
98. Holliday junction is cut by
(a) **Ruv** (b) Rec A (c) RecBCD (d) Cre

99. Consequence of recombination leads to

- (a) Loss of genetic information (b) DNA repair (c) Speed of mobile elements (d) **All the above**

100. Chi site is a _____ base sequence

- (a) 6 (b) **8** (c) 5 (d) 9

SECTION-B (5 Marks)

UNIT-1

1. Write short notes on wobble hypothesis.
2. Give short notes on Theta rolling circle model.
3. Elucidate – Genetic code with appropriate evidence.
4. Inscribe the salient features of reverse transcriptase in RNA replication.
5. Explain shortly about degeneracy.
6. Write a short note on replicase enzyme.

UNIT-2

7. What is mutagenesis? How would you explain?
8. How could you differentiate Spontaneous and conditional mutants?
9. How mutations are benefits to the living organism? Explain in detail.
10. How DNA damage is takes place in cell? Explain briefly.
11. Explain shortly about Ames test.
12. Write a short note on DNA damage.
13. Give a short note on reversion and suppression mutations.
14. Explain shortly about mismatch repair.
15. Write a short note on excision repair.
16. Give a short note on recombination repair .

UNIT-3

17. Give short notes on prokaryotic transcriptional initiation.
18. Write short notes on prokaryotic transcriptional termination.
19. List out salient features of RNA polymerase involved in prokaryotic transcription.
20. Short notes on prokaryotic transcriptional elongation.
21. Explain about Rho enzyme shortly
22. Write a short note on ubiquitination
23. Give short note on translational initiation
24. Explain about factors involved in translational elongation.

25. Write short notes on translational termination.
26. Give short notes on covalent attachments during post translational modification.

UNIT-4

27. Explain about promoter in general.
28. Give short note on enhancer mechanism.
29. Write short note on TATA box.
30. Give short note on silencer mechanism.
31. Explain about the structural genes of lac operon.
32. What is a need for lac operon concept?
33. Explain about IS elements shortly.
34. Give short note on composite transposons.
35. Write short note on non-composite transposons.
36. Explain about LINES and SINES

UNIT-5

37. List out salient features of Rec A.
38. Draw a neat sketch of lambda genome.
39. Write about the characteristics of lambda genome.
40. What is the reason behind the entry of lytic cycle.
41. Explain about lysogeny cycle.
42. Explain about Cro gene activation.
43. Give short notes on CI gene activation.
44. Explain about immediate early genes of lambda phage shortly.
45. Give short note on late genes of lambda phage.
46. Write about non-homologous recombination shortly.

SECTION-C (8Marks)

UNIT-1

1. Give detail account on DNA replication mechanism in prokaryotes.
2. Write an essay on DNA replication in eukaryotes.
3. Write an essay on enzymes involved in prokaryotic and eukaryotic DNA replication.
4. Give a detailed note on RNA replication.
5. Discuss about genetic code, degeneracy and wobble hypothesis in detail.

UNIT-2

6. Explain the biochemical basis of mutation.
7. How will you differentiate the mutants?
8. What is reverse and suppression mutation? Explain in detail
9. How DNA damage is occur in nature? Explain the DNA repair mechanism.
10. Explain about biochemical basis of mutation.
11. Write an essay on base excision and nucleotide excision repair mechanism.
12. Describe about Recombinational repair mechanism in detail.
13. Explain about mismatch repair mechanism in detail.

UNIT-3

14. Write a brief note on prokaryotic transcription process.
15. Describe about the factors involved in prokaryotic transcriptional process.
16. Explain in detail about prokaryotic rRNA processing.
17. Give a detailed account on prokaryotic tRNA processing.
18. Describe about prokaryotic translational process in detail
19. Explain briefly about the post translational modification in prokaryotes.
20. Write an essay on protein export.
21. Discuss about translational regulation in detail.

UNIT-4

22. Give detailed account on cis-regulatory elements.
23. Explain trans-regulatory elements in detail.
24. Describe about lac operon model in detail.
25. Write a brief notes on eukaryotic transposons.
26. Describe IS elements in detail.
27. Give a detailed account on prokaryotic transposons.

UNIT-5

28. Give detail account on homologous recombination.
29. Write an essay on enzymes involved in homologous recombination.
30. Discuss about Rec A and Cre in detail.
31. Give detailed account on life cycle of lambda phage.
32. Describe briefly about transcriptional switch ON genes of lambda phage.
33. Write an essay on transcriptional switch OFF genes of lambda phage.

MOLECULAR DIAGNOSTICS QUESTION BANK

UNIT I

SECTION A:

1. Southern blot was developed by

a) **Edwin Southern** b) Alwine c) Robert Koch d) none

2. The scientist who adopted southern's method for DNA to detect size and quantity RNA was developed by

a) Edwin Southern b) **Alwine** c) Robert Koch d) none

3. The gentler method than nick translation and rarely causes breakage of the DNA is called

a) Random priming b) nick translation c) **end filling** d) biotin labelling

4. The use of dUTP nucleotides modified by reaction with an organic molecule that has affinity to avidin is called

a) horseradish peroxidase labelling b) **biotin labelling** c) nick translation d) end filling

5. The probe with higher activity and therefore able to detect smaller amounts of membrane-bound DNA is called

a) **Random priming** b) nick translation c) end filling d) biotin labelling

6. The essential steps in the isolation of nucleic acids from different species is through

a) **Dissociation of nucleoprotein** b) dissociation of nucleic acid c) dissociation of proteins d) none

7. The structure of DNA was discovered by

a) Watson b) Crick c) **watson and crick** d) Schwann

8. The method of isolation of genomic DNA from a bacterium comprises of

a) bacterial culture growth and cell wall rupture b) DNA purification from the extract c) concentration of DNA solution d) **all the above**

9. The chelating agent necessary for destabilizing the integrity of cell wall is by

a) EtBr b) **EDTA** c) SDS d) TKM

10. The enzyme present in the salivary secretion, egg-white and tears is

a) lysosome b) lactase c) amylase d) **lysozyme**

11. The chemical that helps in the removal of lipid molecule and denaturation of membrane protein is

- a) EDTA **b) SDS** c) EtBr d) Triton-X

12. The nucleic acid that is a polymeric substance of a long single-stranded chain of phosphate and ribose units with the nitrogenous bases is called

- a) DNA b) Protein **c) RNA** d) lipids

13. The nucleic acid that is a polymeric substance of a long double-stranded chain of phosphate and deoxyribose units with the nitrogenous bases is called

- a) DNA** b) Protein c) RNA d) lipids

14. cDNAs are usually cloned in

- a) lambda vectors b) M13 vectors **c) phage insertion vectors** d) shuttle vectors

15. The organism specific collection of DNA covering the entire genome of an organism is called

- a) cDNA library **b) genomic library** c) both a and b d) none

16. The first restriction enzyme discovered is

- a) EcoRI b) Hae III **c) Hind III** d) Sph I

17. The restriction site of EcoRI is

- a) GAATCC b) GATTAC **C) GAATTC** d) GATTCA

18. The gel was soaked in

- a) 0.4M NaOH **b) 0.5M NaOH** c) 0.7M NaOH d) 0.8M NaOH

19. The southern hybridization is used to diagnose

- a) Meningitis b) poliomyelitis **c) sickle-cell anaemia** d) none of the above

20. The second restriction enzyme identified is

- a) EcoRI** b) Hind III c) Hae III d) Sph I

SECTION B:

1. Explain the principle behind the isolation of the nucleic acid?

2. Explain the principle behind the isolation of the protein?
3. Explain the principle behind the purification of the nucleic acid?
4. Explain the techniques in molecular cloning with example?
5. Write a note on the methods of the isolation the nucleic acid?
6. Give an account on the methods of labelling?
7. Explicit the methods of purification on the nucleic acid?
8. Write note on the methods on the isolation of the nucleic acid?
9. Explain the AGE and PAGE techniques?
10. Write a note on southern hybridization?

SECTION C:

1. Explain the method of isolation of nucleic acid and protein?
2. Write a note on the purification of nucleic acid and protein?
3. Explicit the technique of agarose gel electrophoresis?
4. Write a note on the technique of southern hybridization?
5. Give an account on the technique of DNA cloning?
6. Write a note on therapeutic cloning?
7. Write in detail about the methods of labelling the nucleic acids?
8. Explain about molecular cloning?
9. Write a note on the isolation and purification of nucleic acid?
10. Write a note on the isolation and purification of proteins?

UNIT II

SECTION A:

1. The gram negative organisms is
a) actinomycetes b) Bacillus c) Clostridium **d) none of these**
2. Which of the following is a substitute for crystal violet used in gram-staining procedure?
a) methylene blue b) bromocresol green c) safranin d) phenolphthaleine

3. The organism that can be acid-fast stained is
a) Nocardia b) Tubercle bacilli c) Lepra bacilli **d) all of these**
4. Catalase production is negative in which of the following?
a) Streptococcus b) Salmonella c) Proteus d) Staphylococcus
5. Which of the following serves as the first primer in RT-PCR for eukaryotic RNA?
a) oligo A **b) oligo T** c) oligo C d) oligo D
6. In RT-PCR the enzyme deoxynucleotidyl transferase adds poly-G residues in the
a) 5' end of RNA b) 3' end of RNA **c) 3' end of cDNA** d) 5' end of cDNA
7. How many primers are used in the process of reverse transcriptase amplification?
a) 1 **b) 2** c) 3 d) 4
8. From which organism is the enzyme reverse transcriptase isolated?
a) Bacteria b) Fungi **c) Virus** d) Prions
9. Which is the modification of RT-PCR?
a) overlap extension PCR b) inverse PCR c) thermal cycle sequencing PCR **d) RACE**
10. DNA sequencing refers to the
a) technique used to determine the sugar sequence in a DNA molecule
b) technique used to determine the phosphate sequence in a DNA molecule
c) technique used to determine the base sequence in a DNA molecule
d) All of these
11. Which of the following is a chemical nucleotide sequencing method?
a) sanger method **b) maxam-gilbert method** c) edmans method d) automated sequencing method
12. The enzyme used in maxam-gilbert method for labelling ^{32}P labelling of the DNA at 3' end is
a) polynucleotide kinase b) alkaline phosphatase c) exonuclease d) terminal nucleotidyl transferase
13. How many different types of chemical treatments are required in maxam-gilbert method?
a) 1 b) 2 c) 3 **d) 4**

14. The samples in Sanger's method after reaction are separated using
a) AGE **b)PAGE** c)PFGE d)2-D gel electrophoresis
15. Which of the following is not a DNA sequencing method?
a)LMPCR **b)Edmans method** c)Sangers method d)Maxam-Gilbert method
16. The identification of bacteria by serologic tests is based on the presence of specific antigens. Which of the following bacterial components is least likely to contain useful antigens?
a)capsule b)cell wall c)flagella **d)ribosomes**
17. Which is the most likely source of the organism?
a)nose b)colon c)hand d)throat
18. Which of the following disease is best diagnosed by serologic means?
a)pulmonary tuberculosis b)gonorrhoea c)actinomycosis **d)Q fever**
19. Each of the following agents is a recognized cause of diarrhea except
a)clostridium perfringens b)vibrio cholera **c)enterococcus faecalis** d)Escherichia coli
20. Sangers method is also called as
a)chain termination method b)dideoxynucleotide method **c)both a and b** d)none

SECTION B:

1. Write in detail about the pathogen identification in humans?
2. Explain the method of detection of bacterial pathogens through PCR?
3. Describe about the Automated DNA sequencing?
4. Write in detail about the pathogen identification in animals?
5. Explain the method of detection of fungal pathogens through PCR?
6. Write in detail about the pathogen identification in plants?
7. Explain the method of detection of viral pathogens through PCR?
8. Write a note on Real time PCR?
9. Write a note on the DNA sequencing and interpretation?
10. Write a note on Sanger's sequencing?

SECTION C:

- 1.Explain in detail about the Maxam-Gilbert and Sanger's sequencing?
- 2.Write a note on the pathogen identification of human and animal?
- 3.Write in detail about the technique of molecular cloning?
- 4.Explain about the Real time PCR technique?
- 5.Describe about the Automated DNA sequencing?
- 6.Write a note on the detection of the bacterial pathogens through PCR?
- 7.Give an account on the pathogen identification in plants?
- 8.Write a note on the detection of the viral pathogens through PCR?
- 9.Give a note on the technique of PCR?
- 10.Write a note on the detection of the fungal pathogens through PCR?

UNIT III

SECTION A:

- 1.The PCR technique was developed by
a)Kary Mullis b)Kohler c)Milstein d)Altman
- 2.PCR is a
a)DNA degradation technique **b)DNA amplification technique** c)DNA sequencing technique d)all of these
- 3.*Thermus Aquaticus* is the source of
a)Taq polymerase b)vent polymerase c)both a and b d)primase enzyme
- 4.All of the following are thermostable polymerase except
a)Taq polymerase b)vent polymerase **c)DNA polymerase III** d)pfu polymerase
- 5.The first step in PCR is
a)annealing **b)denaturation** c)primer extension d)none of these
- 6.Which of the following serves as the first primer in RT-PCR for eukaryotic RNA?
a)oligo A **b)oligo T** c)oligo C d)oligo D

7. In RT-PCR the enzyme deoxynucleotidyl transferase adds poly-G residues in the
a) 5' end of RNA b) 3' end of RNA **c) 3' end of cDNA** d) 5' end of cDNA
8. How many primers are used in the process of reverse transcriptase amplification?
a) 1 **b) 2** c) 3 d) 4
9. From which organism is the enzyme reverse transcriptase isolated?
a) Bacteria b) Fungi **c) Virus** d) Prions
10. Which is the modification of RT-PCR?
a) overlap extension PCR b) inverse PCR c) thermal cycle sequencing PCR **d) RACE**
11. PCR is used to
a) amplify gene of interest b) construct RAPD maps c) detect the presence of transgene in an organism **d) all of these**
12. Reverse transcriptase PCR uses
a) mRNA as a template to form cDNA b) RNA as a template to form DNA c) DNA as a template to form ssDNA d) all of these
13. PCR is used in
a) site specific recombination **b) site directed mutagenesis** c) both a and b d) site specific translocation
14. Which end of the primer should be matched properly in order to carry out the amplification?
a) 5' end **b) 3' end** c) both of the ends should be matched properly d) any one of the ends should match
15. Which of the following nucleotides should be there at 3' end?
a) any of A, T, G or C will work out b) Either A or T **c) Either G or C**
d) specifically G
16. In the case of uncertainty, if more than one nucleotide is included at a position it is called as
a) mixed site b) polynucleotide site c) unique site d) degenerate site
17. Which type of PCR allows the use of permeabilized tissue?

a)Inverse PCR **b)In-situ PCR** c)quantitative PCR d)Hot-start PCR

18.How many approaches are there for measuring the quantity of PCR products?

a)1 **b)2** c)3 d)4

19.If amplification of one of the strand is favoured, the modification of PCR is known as

a)single strand PCR b)partial PCR **c)asymmetric PCR** d)anchored PCR

20.Gene chip is also called as

a)DNA chip b)Biochip c)DNA microarray **d)all the above**

SECTION B:

1. Write a note on the DNA amplification technique?

2. Give an account in Reverse transcription PCR?

3. Describe in detail about the in-situ PCR?

4. Write a note on the mutational analysis using PCR?

5. Explain in detail about the Gene chips?

6. Write a note on the application on the Gene chips?

7. Write in detail about PCR?

8. Give an brief note on primers?

9. What is experimental design, control and product detection?

10. Define DNA amplification techniques and its applications?

SECTION C:

1. Define DNA and its amplification techniques and its applications?

2. Define primer and its experimental design?

3. Write a note on Reverse transcription?

4. Give a note on in-situ PCR?

5. Define DNA amplification techniques using reverse transcription?

6. Define mutation and write a note on mutational analysis?

7. Write a note on Gene chips and its applications?

8. Define the types of mutational analysis?

9. Write in detail about primers and its product detection?

10. Explicit in detail about PCR and its types?

UNIT IV

SECTION A:

1. FISH stands for

a) Fluorescent insitu hybridization b) fluorescent invitro hybridization c) fluorescent invivo hybridization d) none of these

2. The technique used to identify specific DNA sequence in bacterial colonies is

a) colony hybridization b) insitu hybridization c) dot blot hybridization d) western hybridization

3. FISH is a powerful technique for detecting

a) RNA b) DNA c) ssDNA **d) both a and b**

4. Restriction fragment length polymorphism is

a) are used to determine the position of restriction site in a genome b) are used in physical mapping c) are used in genetic mapping d) usually occur as multiple alleles in a genome

5. The diagrammatic representation of karyotype of a species is called

a) idiogram b) cladogram c) ecogram d) chromogram

6. The sequences that are repeated multiple times and the number of repeats varies from person to person is called

a) VNTR b) STR c) both a and b d) none

7. Forensic science can be defined as the

a) intersection of law b) intersection of science c) both a and b

d) intersection of law and science

8. The plant's or animal's line of evolutionary development from earlier forms is called

a) Genealogy b) Geology c) virology d) none

9. DNA fingerprinting was developed by

a) Francis Crick b) Khorana c) **Alec Jeffrey** d) James Watson

10. DNA profiling technique to demonstrate the similarity between different plant species with reference to some specific protein coding DNA sequences is called

a) phyto blot b) **garden blot** c) plant profiling d) all of these

11. DNA profiling technique to demonstrate the similarity between animal species with reference to some specific protein coding DNA sequences is called

a) **zoo plot** b) phylogenetic blot c) animal profiling d) animal blot

12. DNA profiling is used

a) in forensic studies and in case of disputed parentage b) in pedigree analysis and to study migration pattern c) to confirm cell line identity d) **all of these**

13. Each individual has a unique DNA fingerprint as individuals differ in

a) number of minisatellites on chromosome b) location of minisatellite on chromosome c) size of minisatellite on chromosome d) **all of these**

14. The technique to distinguish the individual based on their DNA print patterns is called

a) DNA fingerprinting b) DNA profiling c) molecular fingerprinting d) **all of these**

15. Molecular markers include

a) RFLP b) RAPD c) AFLP d) **all of these**

16. All the statements are true regarding RFLP and RAPD except

a) RAPD is a quick method compared to RFLP b) RFLP is more reliable than RAPD c) **species specific primers are required for RAPD** d) radioactive probes are not required in RAPD

17. RAPD is a

a) DNA sequencing based method b) Restriction digestion based method c) **PCR based method** d) all of these

18. DNA of eukaryotic organisms has several repeating units of short sequences called

a) random repeats b) **tandem repeats** c) mini satellites d) all of these

19. The variant fragment that distinguishes one individual from another one is called

a) variant fragment b) **marking fragment** c) differing fragment d) all of these

20. Locations of quantitative genes on chromosomes are called

a) **qualitative trait loci** b) quantitative trait loci c) both a and b d) none of these

SECTION B:

1. Give a brief note on DNA fingerprinting?
2. Define karyotyping and the method of karyotype to diagnose genetic disorders?
3. Write an account on Fluorescent in-situ hybridization?
4. Explain in detail about DNA fingerprinting- RAPD for humans?
5. Write a note on DNA fingerprinting-RFLP for humans?
6. Explain in detail about DNA fingerprinting- RAPD for animals?
7. Explain in detail about DNA fingerprinting- RAPD for plants?
8. Write a note on DNA fingerprinting-RFLP for plants?
9. Write a note on DNA fingerprinting-RFLP for animals?
10. Write about PCR in forensic science?

SECTION C:

1. Define karyotyping and the method of karyotype to diagnose genetic disorders?
2. Define banding pattern and the karyotype to diagnose genetic disorders?
3. Explain FISH and write the methods to perform FISH?
4. Explain in detail about DNA fingerprinting- RAPD for humans?
5. Write a note on DNA fingerprinting-RFLP for humans?
6. Explain in detail about DNA fingerprinting- RAPD for animals?
7. Explain in detail about DNA fingerprinting- RAPD for plants?
8. Write a note on DNA fingerprinting-RFLP for plants?
9. Write a note on DNA fingerprinting-RFLP for animals?
10. Write in detail about PCR in forensic science and determination of paternity?

UNIT V

SECTION A:

1. The interaction between antibody and particulate antigen results in visible clumping is called

a) **agglutination** b) precipitation c) complement fixation d) haemagglutination

2. Agglutination is the reaction that occurs between _____ and appropriate antibody.

a) soluble antigen b) partly soluble antigen c) **insoluble antigen** d) none of the above

3. The test used for serotyping is called

a) Tube agglutination test b) **slide agglutination test** c) passive agglutination test
d) haemagglutination test

4. Tube agglutination test is also called as

a) standard agglutination test b) serum agglutination test c) **both a and b** d) none

5. The conversion of precipitating test to an agglutinating test is called

a) Tube agglutination test b) slide agglutination test c) **passive agglutination test**
d) haemagglutination test

6. Precipitation is the reaction that occurs between _____ and appropriate antibody.

a) **soluble antigen** b) partly soluble antigen c) insoluble antigen d) none of the above

7. The Radial immunodiffusion is also called as

a) Ouchterlony method b) **mancini method** c) rocket electrophoresis d) none

8. The Double immunodiffusion is also called as

a) **Ouchterlony method** b) mancini method c) rocket electrophoresis d) none

9. The antibodies in the antiserum react with both the antigens resulting in a smooth line of precipitate is called

a) pattern of non-identity b) pattern of partial identity c) **pattern of identity** d) none

10. The antibodies in the antiserum react with more than one of the antigens than the other is called as

a) pattern of non-identity b) **pattern of partial identity** c) pattern of identity d) none

11. The two antigens are immunologically unrelated as far as that antiserum is concerned is called

a) **pattern of non-identity** b) pattern of partial identity c) pattern of identity d) none

12. The technique of combining electrophoresis and double immunodiffusion is called
a) immunoelectrophoresis b) agglutination c) immunoblotting d) none
13. A negatively charged antigen is electrophoresed in a gel containing antibody is called
a) capillary electrophoresis **b) rocket electrophoresis** c) countercurrent electrophoresis
d) complement fixation
14. The antigen and antibody has opposite charges is called as
a) capillary electrophoresis b) rocket electrophoresis **c) countercurrent electrophoresis**
d) complement fixation
15. The technique of transferring DNA, RNA and protein is called
a) capillary electrophoresis b) rocket electrophoresis **c) immunoblotting** d) complement
fixation
16. The technique of transferring DNA is called
a) northern blot b) western blot **c) southern blot** d) none
17. Western blotting was introduced in the year
a) 1991 **b) 1981** c) 1978 d) 1990
18. The western blot is a technique to blot
a) DNA b) RNA **c) protein** d) nucleic acid
19. The technique for transferring RNA is called
a) northern blot b) western blot c) southern blot d) none
20. Sandwich ELISA is used to
a) measure antigen b) qualitate antigen c) quantitate antigen d) none

SECTION B:

1. Define agglutination and its types?
2. Define precipitation and its types?
3. Write a note on ABO blood grouping?
4. Define immunodiffusion and its types?
5. Write a note on Radial immunodiffusion?

6. Write a note on Immunoblotting with an example?
7. Define ELISA and its types?
8. Define HLA-typing?
9. Write a detailed note on Double immunodiffusion?
10. Explain rocket immune electrophoresis?

SECTION C:

1. Define agglutination and its types?
2. Define Radial immunodiffusion and Double immune diffusion?
3. Write in detail about HLA-typing?
4. Give a note on rocket immuno electrophoresis?
5. Explicit Capillary immuno electrophoresis?
6. What is Immuno-blotting and explain southern blotting?
7. What is precipitation and explain its types?
8. Define Immunodiffusion and its types with diagrams?
9. Define Sandwich ELISA?
10. Write a note on Immuno electrophoresis?

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QUESTION BANK



III-B.Sc. Biotechnology (2016-2019 batch)

SUBJECT CODE: 16UBT5E1

PAPER TITLE: Major Elective: Nanobiotechnology and Intellectual property rights

PG AND RESEARCH DEPARTMENT OF BIOTECHNOLOGY

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SECTION – A (One Mark)

Choose the correct answer

UNIT-I

1. The prefix "nano" comes from a
- a) French word meaning billion
 - b) Greek word meaning dwarf
 - c) Spanish word meaning particle
 - d) Latin word meaning invisible

Answer: b) Greek word meaning dwarf

2. Who first used the term nanotechnology and when?
- a) Richard Feynman, 1959
 - b) Norio Taniguchi, 1974
 - c) Eric Drexler, 1986
 - d) Sumio Iijima, 1991

Answer: b) Norio Taniguchi, 1974

3. What is a buckyball?
- a) A carbon molecule (C60)
 - b) Nickname for Mercedes-Benz's futuristic concept car (C111)
 - c) Plastic explosives nanoparticle (C4)
 - d) Concrete nanoparticle with a compressive strength of 20 nanonewtons (C20)

Answer: a) A carbon molecule (C60)

4. Which of these historical works of art contain nanotechnology?
- a) Lycurgus cup
 - b) Medieval stained glass windows in churches
 - c) Damascus steel swords
 - d) All of the above

Answer: d) All of the above

5. What is depicted in this famous image?
- a) Artist's nanoscale illustration of the Circus Maximus in Rome
 - b) Scanning Tunneling Microscope image of electrons surrounded by iron atoms
 - c) Simulation of underwater volcanoes near the Hawaiian Islands
 - d) Nanoscale version of a bear trap to capture nanoparticles

Answer: b) Scanning Tunneling Microscope image of electrons surrounded by iron atoms

6. Richard Feynman is often credited with predicting the potential of nanotechnology. What was the title of his famous speech given on December 29, 1959?

- a) There is a tiny room at the bottom
- b) Things get nanoscopic at the bottom
- c) Bottom? What bottom?
- d) There is plenty of room at the bottom

Answer: d) There is plenty of room at the bottom

7. How many oxygen atoms lined up in a row would fit in a one nanometer space?

- a) None; an oxygen atom is bigger than 1 nm
- b) One
- c) Seven
- d) Seventy

Answer: c) Seven

8. Which one of these statements is NOT true?

- a) Gold at the nanoscale is red
- b) Copper at the nanoscale is transparent
- c) Silicon at the nanoscale is an insulator
- d) Aluminum at the nanoscale is highly combustible

Answer: c) Silicon at the nanoscale is an insulator

9. Which of these consumer products is already being made using nanotechnology methods?

- a) Fishing lure
- b) Golf ball
- c) Sunscreen lotion
- d) All of the above

Answer: d) All of the above

10. If you were to shrink yourself down until you were only a nanometer tall, how thick would a sheet of paper appear to you?

- a) 170 meters
- b) 1.7 kilometers (a bit more than a mile)
- c) 17 kilometers
- d) 170 kilometers

Answer: d) 170 kilometers

11. What is graphene?

- a) A new material made from carbon nanotubes

- b) A one-atom thick sheet of carbon
- c) Thin film made from fullerenes
- d) A software tool to measure and graphically represent nanoparticles

Answer: b) A one-atom thick sheet of carbon

12. Which of these well-known phrases from Star Trek depends on the (fictional) use of nanotechnology?

- a) Beam me up, Scotty!
- b) Tea. Earl Grey. Hot.
- c) You will be assimilated. Resistance is futile.
- d) All of the above

Answer: d) All of the above

13. What is grey goo?

- a) A hypothetical substance composed of out-of-control self-replicating nanobots that consumes all living matter on Earth
- b) The feeder material used to grow grey nanoparticles in the laboratory
- c) Toxic byproduct resulting from the synthesis of carbon nanotubes
- d) Waste product from the production of nanoglue made from the membranes on the feet of the Madagascan Grey Gecko

Answer: a) A hypothetical substance composed of out-of-control self-replicating nanobots that consumes all living matter on Earth

14. Which one of these condiments is unique due to the nanoscale interactions between its ingredients?

- a) Ketchup
- b) Mustard
- c) Mayonnaise
- d) All of the above

Answer: c) Mayonnaise

15. Nanorobots (nanobots)...

- a) Do not exist yet
- b) Exist in experimental form in laboratories
- c) Are already used in nanomedicine to remove plaque from the walls of arteries
- d) Will be used by NASA in the next unmanned mission to Mars

Answer: a) Do not exist yet

16. What is the 2017 budget for the U.S. National Nanotechnology Initiative?

- a) \$587 million
- b) \$917 million
- c) \$1.4 billion
- d) \$2.1 billion

Answer: c) \$1.4 billion

17. Plasmonics is...

- a) A field of nanophotonics that holds the promise of molecular-size optical device technology
- b) The science of fluorescent nanoparticles used in modern fireworks
- c) A hypothetical science used in science fiction weaponry (plasma cannons)
- d) The technology used to design and build the laser-guided photonic gyroscopes used in aviation.

Answer: a) A field of nanophotonics that holds the promise of molecular-size optical device technology

18. Optical tweezers...

- a) Are used to remove facial hair with miniaturized laser beams
- b) Use light to manipulate particles as small as a single atom
- c) Are a nanotechnology-based tool for stamp collectors
- d) Don't exist

Answer: b) Use light to manipulate particles as small as a single atom

19. A silver coin with a diameter of 4 cm (such as the U.S. silver dollar) contains 26.96 grams of coin silver and has a surface area of about 27.7 square cm. If the same 26.96 grams of coin silver were divided into particles 1 nanometer in diameter, what would their combined surface area be?

- a) 11.4 square meters
- b) 140 square meters
- c) 1,400 square meters
- d) 11,400 square meters

Answer: d) 11,400 square meters

20. And what exactly is a quantum dot?

- a) A semiconductor nanostructure that confines the motion of conduction band electrons, valence band holes, or excitons in all three spatial directions.
- b) The sharpest possible tip of an Atomic Force Microscope
- c) A fictional term used in science fiction for the endpoints of wormholes

d) Unexplained spots that appear in electron microscopy images of nanostructures smaller than 1 nanometer

Answer: a) A semiconductor nanostructure that confines the motion of conduction band electrons, valence band holes, or excitons in all three spatial directions.

UNIT-II

21. Which of the following is an example of top-down approach for the preparation of nanomaterials?

- a) Gas phase agglomeration
- b) Molecular self-assembly
- c) Mechanical grinding
- d) Molecular beam epitaxy

Answer: c) Mechanical grinding

22. Which of the following is an example of bottom-up approach for the preparation of nanomaterials?

- a) Etching
- b) Dip pen nano-lithography
- c) Lithography
- d) Erosion

Answer: b) Dip pen nano-lithography

23. The properties like melting point, solubility, color, etc changes on varying the

- a) Size
- b) Composition
- c) Surface properties
- d) None of the mentioned

Answer: a) Size

24. The properties like dispersibility, conductivity, etc changes on varying the

- a) Size
- b) Composition
- c) Surface properties
- d) None of the mentioned

Answer: c) Surface properties

25. Quantum confinement results in

- a) Energy gap in semiconductor is proportional to the inverse of the square root of size
- b) Energy gap in semiconductor is proportional to the inverse of the size

- c) Energy gap in semiconductor is proportional to the square of size
- d) Energy gap in semiconductor is proportional to the inverse of the square of size

Answer: d) Energy gap in semiconductor is proportional to the inverse of the square of size

26. Which of the following is the principal factor which causes the properties of nanomaterials to differ significantly from other materials?

- a) Size distribution
- b) Specific surface feature
- c) Quantum size effects
- d) All the mentioned

Answer: d) All the mentioned

27. Select the incorrect statement from the following options.

- a) Self-assembly is a top-down manufacturing technique?
- b) In self-assembly, weak interactions play very important role
- c) Self-assembling molecules adopt an organised structure which is thermodynamically more stable than the single, unassembled components
- d) Compared to the isolated components, the self-assembled structure has a higher order

Answer: a) Self-assembly is a top-down manufacturing technique

28. Which of the following is the application of nanotechnology to food science and technology?

- a) Agriculture
- b) Food safety and biosecurity
- c) Product development
- d) All of the mentioned

Answer: d) All of the mentioned

29. What are the advantages of nano-composite packages?

- a) Lighter and biodegradable
- b) Enhanced thermal stability, conductivity and mechanical strength
- c) Gas barrier properties
- d) All of the mentioned

Answer: d) All of the mentioned

30. The efficiency of today's best solar cell is about

- a) 15-20%
- b) 40%
- c) 50%
- d) 75%

Answer: b) 40%

31. For high sensitivity or selectivity environmental sensors to sense the gaseous chemical like _

- a) CO₂
- b) NO₃
- c) O₂
- d) NO

Answer: d) NO

32. The synthesized magnetic nano particles from _____ have been found to self-arrange automatically.

- a) Zinc
- b) Copper
- c) Iron
- d) Zirconium

Answer: c) Iron

33. The nano particles from iron and palladium are used to produce _____

- a) Magnets
- b) Magnetic lens
- c) Magneto meters
- d) Magnetic storage devices

Answer: d) Magnetic storage devices

34. Coating the nano crystals with the ceramics is carried that leads to _____

- a) Corrosion
- b) Corrosion resistant
- c) Wear and tear
- d) Soft

Answer: b) Corrosion resistant

35. The _____ to the ceramics are superior coatings.

- a) Nano particles
- b) Nano powder
- c) Nano crystals coating
- d) Nano gel

Answer: c) Nano crystals coating

36. _____ of ceramic components are easier through nano structuring.

- a) Lubrication
- b) Coating
- c) Fabrication
- d) Wear

Answer: c) Fabrication

37. By nano scale distribution of the _____ in matrix improves the life and performance.

- a) Carbide
- b) Tungsten
- c) Hydrides
- d) Nitrites

Answer: b) Tungsten

38. Industrial catalysts should have specific properties such as

- a) High surface area
- b) Low surface area
- c) Moderate surface area
- d) Limited surface area

Answer: a) High

39. The extensively used nano particles as catalyst is

- a) Silver
- b) Copper
- c) Gold
- d) Cerium

Answer: c) Gold

40. Due to _____ tensile strength some of the nano materials are used in air crafts.

- a) High
- b) Low
- c) Moderate
- d) No

Answer: a) High

UNIT - III

41. Which of the following is not a limitation of Beer Lambert's law, which gives the relation between absorption, thickness, and concentration?

- a) Concentration must be lower
- b) Radiation must have higher bandwidth
- c) Radiation source must be monochromatic
- d) Does not consider factors other than thickness and concentration that affect absorbance

Answer: b) Radiation must have higher

bandwidth

42. Beer's law states that the intensity of light decreases with respect to _____

- a) Concentration

- b) Distance
- c) Composition
- d) Volume

Answer: a) Concentration

43. Lambert's law states that the intensity of light decreases with respect to

- a) Concentration
- b) Distance
- c) Composition
- d) Volume

Answer: b) Distance

44. Which of the following is not true about Absorption spectroscopy?

- a) It involves transmission
- b) Scattering is kept minimum
- c) Reflection is kept maximum
- d) Intensity of radiation leaving the substance is an indication of concentration

Answer: c) Reflection is kept maximum

45. Which of the following wavelength ranges is associated with UV spectroscopy?

- a) 0.8 - 500 μ m
- b) 400 - 100nm
- c) 380 - 750nm
- d) 0.01 - 10nm

Answer: b) 400 - 100nm

46. In infrared spectroscopy which frequency range is known as the fingerprint region?

- a) 400 - 1400 cm^{-1}
- b) 1400 - 900 cm^{-1}
- c) 900 - 600 cm^{-1}
- d) 600 - 250 cm^{-1}

Answer: b) 1400 - 900 cm^{-1}

47. In which region of the infrared spectrum would you expect to find a peak characteristic of a triple bond stretch?

- a) 4000 - 3000 cm^{-1}
- b) 2500 - 2000 cm^{-1}
- c) 2000 - 1500 cm^{-1}

d) 1500 - 750cm⁻¹

Answer:b) 2500 - 2000cm⁻¹

48. In a chromatographic separation, which of the following indices is most appropriate for the qualitative identification of a substance?

- a) Relative retention factor R_{rel}
- b) Retention factor R_f
- c) Retention time
- d) Resolution

Answer:b) Retention factor R_f

49. In which region of the electromagnetic spectrum does an absorption at 600 nm come?

- a) Near -UV
- b) Infrared
- c) Vacuum-UV
- d) Visible

Answer: d) Visible

50. In which region of the electromagnetic spectrum does an absorption at 177 nm come?

- a) Near -UV
- b) Visible
- c) Infrared
- d) Vacuum-UV

Answer: d) Vacuum-UV

51. What is a red shift?

- a) The shifting of an absorption towards the blue end of the spectrum
- b) The shifting of an absorption to shorter wavelength.
- c) The shifting of an absorption to lower energy
- d) The shifting of an absorption to higher energy

Answer: c) The shifting of an absorption to lower

energy

52. What is a chromophore?

- a) A group of atoms in a compound responsible for electromagnetic radiation
- b) A coloured compound
- c) A group of atoms in a coloured compound
- d) A group of atoms in a compound responsible for the absorption of electromagnetic radiation

Answer: d) A group of atoms in a compound responsible for the absorption of electromagnetic radiation

53. Molar absorptivities of compounds exhibiting charge transfer absorption are

- a) Small
- b) Moderate
- c) Large
- d) None of these

Answer: c) Large

54. Molar absorptivity is the measure of the

- a) Amount of light absorbed per unit length
- b) Amount of light absorbed per unit concentration
- c) Amount of light reflected and absorbed per unit concentration
- d) None of the above

Answer: b) Amount of light absorbed per unit concentration

55. In the past, IR spectra had to be acquired one wavelength at a time, which took a long time.

Today quick spectra is due to the

- a) The Fourier Transfer Algorithm allows us to scan all frequencies at once
- b) Light is faster today that it used to be
- c) Absence of broad spectrum of wavelength
- d) None of the above

Answer: a) The Fourier Transfer Algorithm allows us to scan all frequencies at once

56. Which of the following is not an IR vibrational mode?

- a) Stretching
- b) Scissoring
- c) Rocking
- d) Rolling

Answer: d) Rolling

57. Nano particles target the rare _____ causing cells and remove them from blood.

- a) Tumour
- b) Fever
- c) Infection
- d) Cold

Answer: a) Tumour

58. _____ is the field in which the nano particles are used with silica coated iron oxide iron oxide.

- a) Magnetic applications
- b) Electronics
- c) Medical diagnosis
- d) Structural and mechanical materials

Answer: c) Medical diagnosis

59. DNA detection through the _____ by using the oligonucleotide functionalized gold nano crystals is developed.

- a) Colorimetric
- b) Diathermy
- c) Electro therapy
- d) Treatment tables

Answer: a) Colorimetric

60. Fabrics are extensively made out of nano materials like _____

- a) Carbon nano tubes
- b) Fullerenes
- c) Mega tubes
- d) Polymers

Answer: b) Fullerenes

UNIT-IV

61. The size of red and white blood cells is in the range of

- a) 2-5 μm
- b) 5-8 μm
- c) 8-11 μm
- d) 12-14 μm

Answer: a) 2-5 μm

62. About how many types of cancer are there?

- a) There are roughly 50 types of cancer.
- b) There are more than 100 types of cancer.
- c) There about 300 types of cancer.
- d) There are more than 1,000 types of cancer.

Answer: b) There are more than 100 types of cancer.

63. Across the globe, _____ is the most common type of cancer that kills men.

- a) Lung cancer
- b) Prostate cancer
- c) Penile cancers
- d) Oral Cancer

Answer: a) Lung cancer

64. Worldwide, _____ is the most common cancer that kills women.

- a) Stomach cancer
- b) Skin cancer
- c) Ovarian cancer
- d) Breast cancer

Answer: d) Breast cancer

65. _____ is the most common form of cancer in all humans.

- a) Brain cancer
- b) Leukemia
- c) Skin cancer
- d) Colon cancer

Answer: c) Skin cancer

66. Which of the viruses below causes cancer resulting from chronic infection?

- a) Herpes simplex viruses (HSV)
- b) Human papilloma virus (HPV)
- c) Hepatitis B Virus (HBV)
- d) Both b and c

Answer: d) Both b and c

67. What kind of foods are linked to colon cancer?

- a) Processed meats
- b) Microwavable foods
- c) Foods with salt substitutes
- d) Shellfish

Answer: a) Processed meats

68. Cancer of the blood cells is referred to as

- a) Kaposi Sarcoma
- b) Basal Cell Carcinoma
- c) Mesothelioma

d) Leukemia

Answer: d) Leukemia

69. **Gold nanoparticles** are emerging as promising agents for

- a) Antibacterial
- b) Antifungal
- c) Antidiabetics
- d) Anticancer

Answer: Anticancer

70. SWCNTs)

- a) single-wall **carbon nanotubes**
- b) signal-wall carbon nanotubes
- c) Most single-walled nanotube
- d) saturable-well carbon nanotubes

Answers: a) single-wall carbon nanotubes

71. 1. _____ poisoning water in Japan is from fishes.

- a) Bismuth
- b) Arsenic
- c) Antimony
- d) Palladium

Answer: b) Arsenic

72. Fishes can store more quantity of _____ in their bodies.

- a) Mercury
- b) Bismuth
- c) Palladium
- d) Chlorine

Answer: a) Mercury

73. Waste water released from _____ are not the sources of bacteria.

- a) Sanitaria
- b) Municipalities
- c) Tanning
- d) Industries

Answer: d) Industries

74. Bacteria and microorganisms present in the water will cause _____ in human and animals.

- a) Indigestion
- b) Intestinal tract
- c) Brain tumour
- d) Cancer

Answer: b) Intestinal tract

75. Infectious hepatitis is caused by _____

- a) Bacteria
- b) Viruses
- c) Protozoa
- d) Helminth

Answer: b) Viruses

76. Helminth in the water causes _____

- a) Hook worm
- b) Amoebic dysentery
- c) Cholera
- d) Typhoid

Answer: a) Hook worm

77. The _____ is an important requirement of the aquatic life.

- a) Dissolved nitrogen
- b) Dissolved chlorine
- c) Dissolved oxygen
- d) Dissolved methane

Answer: c) Dissolved oxygen

78. What is the full form of BOD?

- a) Biochemical oxygen demand
- b) Biological oxygen demand
- c) Biometric oxygen deep water
- d) Biological oxygen deep water

Answer: Biochemical oxygen demand

79. The organic matter present in the water is of _____ types.

- a) Two
- b) Three
- c) Four
- d) Five

Answer: a) Two

80. Which nanomaterials used for drinking water purification commercially?

- a) Silver
- b) Cupper
- c) Zinc
- d) Carbon

Answer: d) Carbon

UNIT-V

81. Intellectual Property Rights (IPR) protect the use of information and ideas that are of

- a) Ethical value
- b) Moral value
- c) Social value
- d) Commercial value

Answer: d) Commercial value

82. The term 'Intellectual Property Rights' covers

- a) Copyrights
- b) Know-how
- c) Trade dress
- d) All of the above

Answer: d) All the above

83. The following can be patented

- a) Machine
- b) Process
- c) Composition of matter
- d) All of the above

Answer: d) All of the above

84. In India, the literary work is protected until

- a) Lifetime of author
- b) 25 years after the death of author
- c) 40 years after the death of author
- d) 60 years after the death of author

Answer: d) 60 years after the death of author

85. Design does not include

- a) Features of shape

- b) Composition of lines or colours
- c) Mode or principle of construction
- d) None of the above

Answer: c) Mode or principle of construction

86. The agreement that is enforceable by law is known as

- a) Valid agreement
- b) Void agreement
- c) Illegal agreement
- d) Unenforceable agreement

Answer: a) Valid agreement

87. Which of the following is (are) included in Geographical indications of Goods

- a) Handicraft
- b) Foodstuff
- c) Manufactured
- d) All of the above

Answer: d) All of the above

88. The term “WIPO” stands for:-

- a) World Investment policy organization
- b) World intellectual property organization
- c) Wildlife Investigation and Policing organization
- d) World institute for Prevention of organized crime

Answer: b) World intellectual property

organization

89. A new way to process milk so that there is no fat in any cheese made from it.

- a) Copy rights
- b) Trade mark
- c) Patent
- d) Industrial designs

Answer: c) Patent

90. A company decides to use a logo that has the same shape as its competitor but with a different color

- a) Copy rights
- b) Trade mark
- c) Patent

d) Industrial designs

Answer: d) Industrial designs

91. The term of copyright for an author lasts how long?

- a) The life of the author
- b) The life of the author plus 60 years
- c) 95 years
- d) 75 years

Answer: c) 95 years

92. Trademark can be used as domain name

- a) Yes
- b) No
- c) Yes in some cases
- d) None of the above

Answer: a) Yes

93. Who administer UDRP?

- a) WTO
- b) WIPO
- c) Supreme Court
- d) High court

Answer: b) WIPO

94. Certification mark can be registered in

- a) Trademark Registry
- b) Certification Board
- c) Quality Control Board
- d) MHRD

Answer: a) Trademark Registry

95. The Copyright Act, 1957 came into effect from

- a) January 1958
- b) April 1958
- c) June 1958
- d) August 1958

Answer: a) January 1958

96. Information Technology Act, 2000 amended in

- a) 2008

- b) 2010
- c) 2012
- d) 2014

Answer: a) 2008

97. Trade Marks Act in India enacted in

- a) 1999**
- b) 2000
- c) 2001
- d) 2002

Answer: a) 1999

98. Indian Design Act enacted in

- a) 2000
- b) 2001
- c) 2002
- d) 2005

Answer: a) 2000

99. The Indian Patents & Design Act enacted in

- a) 1910
- b) 1911
- c) 2002
- d) 2005

Answer: b) 1911

100. World Book and Copyright Day celebrated by UNESCO in

- a) 20th April
- b) 21st April
- c) 22nd April
- d) 23rd April

Answer: d) 23rd April

Section – B

5 Marks

Unit-I

1. What are quantum dots used for?
2. What are quantum dots in nanotechnology?
3. How do quantum dots detect cancer?
4. What is quantum confinement in quantum dots?
5. What is basic difference between quantum dots and nanoparticles?
6. What is structural DNA nanotechnology?
7. What is structural RNA nanotechnology?
8. How can nanotechnology be used to work with DNA?
9. Explain aptamer?
10. What is molecular nanotechnology the future of medicine?

Unit-II

11. How nanoparticles are synthesized?
12. What are the types of nanomaterials?
13. What are the basic approaches used to prepare nanomaterials?
14. What are the properties of nanomaterials?
15. What are nanomaterials give the classification of nanomaterials?
16. Why nanomaterials exhibit different properties explain?
17. Which is the most important property of nanomaterial?
18. Explain chemical synthesis of nanoparticles.
19. Explain PVD.
20. Explain laser pyrolysis.

Unit-III

21. What is use of UV-Vis spectrum in nanoparticles characterization?
22. What is application of FTIR spectrum in nanoparticles characterization?
23. What is application of XRD in nanoparticles characterization?
24. Explain electron microscope.
25. What are the applications of AFM?
26. What are the applications of STM?
27. Give details note of AFM in biological utilization.

28. Give details note on STM in surface analysis.
29. What is EDXS? Give detailed note on composition analysis.
30. Explain microbial nanotechnology

UNIT-IV

31. How is nanotechnology used in medicine?
32. What are the benefits of silver nanoparticles?
33. What is the primary goal of early nanotechnology?
34. What is the difference between bulk materials and nano materials?
35. What is the applications of gold nanoparticles?
36. What is applications of zinc nanoparticles?
37. Explain carbon nanotube in environmental applications
38. Give details account on Phytonanomedicine?
39. Mechanisms of plant extract in nanoparticles preparation.
40. Explain viral nanoparticles.

UNIT-V

41. What is meant by IPR?
42. What is IPR and its importance?
43. What is IPR in biotechnology?
44. What is intellectual property rights PPT?
45. How do I get intellectual property rights in India?
46. What is IPR Act in India?
47. What are the legislation covering IPR in India?
48. What are some examples of intellectual property?
49. What is difference between copyright and patent?
50. What are the five types of intellectual property?

Section- C

8 Marks

UNIT-I

1. Why do nanoparticles have different properties to bulk material?
2. Which is the most important property of nanomaterial?
How the physical and chemical properties of nanoparticles vary with their size?
3. Why nanoparticles are better than microparticles?
4. Explain protein nanotechnology.
5. What are colloidal nanoparticles?
6. What are gold nanoparticles used for?
7. Explain antibody nanotechnology.
8. Do larger nanoparticles absorb shorter or longer wavelengths of light? Explain.
9. Why are gold nanoparticles red surface plasmon theory?
10. Explain peptide nanotechnology in disease management.

UNIT-II

11. What is an example of top down processing?
12. What are the advantages of top down approach?
13. What is difference between top down and bottom up approach?
14. What do you mean by top down approach and bottom up approach of programming?
15. How metal nanoparticles synthesis from plant extract?
16. What is microbial synthesis of nanoparticles?
17. Give details account on virus in nanomaterials synthesis process.
18. Give details note on PVD.
19. What is microemulsion? How nanoparticles are prepared from microemulsion technique.
20. Give details note on electronegative waves in nanoparticles synthesis.

UNIT-III

21. What is an electron microscope and what is it used for?
22. What can be seen with an electron microscope?
23. What are the 3 types of electron microscopes?
24. How does TEM work?
25. How does FESEM work?
26. What is the difference between TEM and SEM?

27. What is AFM analysis?
28. What is STM analysis?
29. What is the difference between STM and AFM?
30. Why SEM is so important in biological research?

UNIT-IV

31. What are the applications of nanomaterials?
32. What is carbon nanoparticles and why is it important in medicine?
33. What products use nanotechnology?
34. How do we use nanotechnology in everyday life?
35. What are some examples of nanoparticles in textile applications?
36. Give details note on antimicrobial mechanisms of silver nanoparticles.
37. What could nanoparticles be used for in the future?
38. Give details note on anticancer mechanisms of gold and gold coated nanoparticles.
39. Give details note on applications of nanoparticles in drinking water treatment.
40. Which nanoparticles are used in cancer treatment?

UNIT-V

41. What are the rights of a patent holder?
42. "Intellectual Property rights have an in-built sunset"- Explain
43. Explain briefly about four important intellectual property rights.
44. What is the procedure for registration of a trademark?
45. What is the method of assigning copyright in a work?
46. When information is called confidential information? What precautions a owner of such information has to take to sustain it as such confidential information?
47. What are the various types of Intellectual Property rights?
48. Explain 'cyberspace' and impact of law.
49. When a trade secret agreement is said to be violated and what are the remedies for it?
50. What is the impact of internet on copyright?

KONGUNADU ARTS AND SCIENCE COLLEGE

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QUESTION BANK



III-B.Sc. Biotechnology (2016-2019 batch)

SUBJECT CODE: *15UBT508*

PAPER TITLE: **RECOMBINANT DNA TECHNOLOGY**

PG AND RESEARCH DEPARTMENT OF BIOTECHNOLOGY

NOVEMBER 2018

SECTION – A (1 MARK)

UNIT – I

1. The genetic engineer's tool or molecular tools which is most commonly used in recombinant DNA experiments.
a. DNA fragments b. **Enzymes** c. Bacteria d. Yeast
2. The enzymes that restrict the viral replication are known as
a. **Restriction endonucleases** b. topoisomerases
c. Polymerases d. modifying enzymes
3. Which is the first endonucleases discovered.
a. *EcoRI* b. *HindIII* c. *BamHII* d. *HaeIII*
4. Which is the site where the DNA is cut by restriction endonucleases.
a. Ori C b. Recombinant sequence
c. **Recognition sequence** d. Gene
5. The cut DNA fragments are covalently joined together by
a. DNA polymerases b. Nucleases c. **DNA ligases** d. RNA polymerase
6. Which are chemically synthesized, short, double stranded DNA molecules.
a. **Linkers** b. Recombinant DNA c. Primers d. Restriction enzymes
7. The enzyme involved in the removal of phosphate group is
a. Nucleases b. Polynucleotide kinase
c. **Alkaline phosphatase** d. Terminal transferase
8. The groups of enzymes that catalyze the synthesis of nucleic acid molecules are collectively referred as
a. Reverse transcriptase b. RNase H
c. DNase I d. **Polymerases**
9. The enzyme involved in the addition of phosphate group is
a. Nucleases b. **Polynucleotide kinase**
c. Alkaline phosphatase d. Terminal transferase
10. Which of the following bacteria was the first organism used in the DNA technology experiments and continues to be the host of choice.
a. *B. subtilis* b. *E. coli* c. *B. amyloliquefaciens* d. *N. otitidis*
11. Which bacterium is considered as an alternative to *E. coli*?

UNIT – II

21. Which of the following is widely used as a cloning vehicle.
- a. DNA b. RNA c. Proteins d. **Plasmids**
22. pBluescript is a commonly available
- a. **phagemid** b. cosmid c. artificial vector d. plasmid vector
23. pBR322 is a plasmid discovered by
- a. Boyer and Cohen b. Jacob and monad
- c. **Bolivar and Rodriguez** d. Boyer and Rodriguez
24. pBR322 has a DNA sequence of
- a. 1346 bp b. 2651 bp c. 3461 bp d. **4361 bp**
25. What are the carrier DNAs into which ‘foreign’ DNA or genes of interest are spliced to make a recombinant DNA.
- a. **Vectors** b. Clones c. Both a and b d. Neither
26. The complete technique of isolating a gene of interest and inserting it in to a vector and then replicating and maintaining it in to a host cell is called as
- a. Gene expression b. **Gene cloning**
- c. Gene modification d. None of the above
27. Wild type of λ phage could accommodate foreign DNA only of
- a. 1.5 Kb b. 2 Kb c. **2.5 Kb** d. 3.5 Kb
28. A replacement vector has two restriction sites which flank a region known as
- a. DNA fragment b. RNA fragment
- c. **Stuffer fragment** d. None of the above
29. Which of the following are the novel cloning vectors which possess properties of both plasmid and λ phage
- a. Plasmids b. **Cosmids** c. Phagemids d. Artificial chromosome
30. Inducer used in the *lac* operon is
- a. Lactose b. IPTG c. **Both a & b** d. X-gal
31. What is essential for packaging of nucleic acid into protein coat
- a. att sites b. **cos sites** c. ori sites d. restriction site
32. What refers to the number of molecules of an individual plasmid that are normally found in a single bacterial cell

UNIT – III

41. Which of the following vector is shuttle vector?
- a. lambda vector
 - b. cosmid
 - c. **yeast episomal plasmid**
 - d. BAC
42. Vector containing a yeast centromere, telomeres, a bacterial origin of replication, and bacterial selectable markers
- a. Yeast episomal plasmid
 - b. Yeast replicative plasmid
 - c. **YAC**
 - d. Yeast integrative plasmid
43. Ti plasmid vectors include
- a. episomal vector
 - b. Multiple and Co-integrate vectors
 - c. Co-integrate and selective vector
 - d. **Binary and Co-integrate vectors**
44. Recombinant proteins accumulate intracellularly in insoluble aggregates.
- a. **Inclusion bodies**
 - b. Active proteins
 - c. Soluble proteins
 - d. Excretory proteins
45. Which are regions with a specific base sequence, to which RNA polymerase will bind.
- a. **Promoters**
 - b. Operators
 - c. Inducer
 - d. Repressor
46. Which are simply designed to express detectable levels of foreign proteins usually at the bench-scale level.
- a. Cloning vector
 - b. **Expression vector**
 - c. Production vector
 - d. Insertion vector
47. Which remain as independent plasmids and do not integrate.
- a. YEps
 - b. YIps
 - c. YCps
 - d. **YRps**
48. Which of the following vector have centromeric and telomeric region of a chromosome.
- a. YEps
 - b. **YAC**
 - c. BAC
 - d. PAC
49. Which vector are capable of maintaining human and plant genomic fragments of greater than 300 Kb for over 100 generations with a high degree of stability.
- a. **BAC**
 - b. YAC
 - c. PAC
 - d. YRps
50. The first BAC vector developed was

- a. pBAC102L b. pBAC104L c. pBAC106L d. **pBAC108L**

51. Recombinant DNA cloning refers to:

1. splitting of a zygote into two cells to generate a set of identical twins
2. creating a genetically identical frog by treatment of a frog epithelial cell
3. isolation of a genetically pure colony all of whose cells contain a specific desired recombinant DNA construct
4. construction of a recombinant DNA library
5. the use of DNA ligase to join different DNA molecules

- a. only 1 b. 1 & 2 c. only 3 d. **3, 4 & 5**

52. Which of the phenolic compounds facilitate the entry of the bacterium into plant tissues.

- a. Opines b. Sugars c. **Acetosyringone** d. Nopaline

53. Which of the following proteins protects the T-DNA from degradation by nucleases?

- a. **Vir E2** b. *Vir E1* c. *Vir D1* d. *Vir D2*.

54. During recombinant DNA techniques, how are the bacterial cells that take up the plasmids isolated from those that do not?

- a. screening for restriction fragment length polymorphisms
- b. using antibiotic resistance plasmid genes and antibiotic-containing media**
- c. sequencing each of the plasmids
- d. using mRNA or information on the protein sequence

55. How do you help ensure that each bacterium in a library contains only one gene-containing plasmid?

- a. Genes with more than one plasmid do not survive the antibiotic
- b. You need to screen using a radioactive RNA probe**
- c. It is a matter of numbers and probability-far more bacteria than plasmids are mixed together
- d. Only a small amount of calcium salt is used to facilitate the incorporation of the plasmid into the bacterial cell

56. YIp's is

- a. Yeast interactive plasmid b. Yeast initiative plasmid
c. Yeast interruptive plasmid d. **Yeast integrative plasmid**

57. The structural gene *z* in *lac* operon codes for
- β -galactosidase**
 - lactose permease
 - transacetylase
 - None of the above
58. If the protein does not take up its correctly folded tertiary structure leading to insoluble form called as
- Hairpin bend
 - Inclusion body**
 - Excretions
 - Metabolites
59. A typical cassette contains
- Promoter
 - Terminator
 - Ribosome binding site
 - All the above**
60. T-DNA is:
- DNA of plasmid origin which is transferred to the *Agrobacterium* chromosome
 - DNA from the chromosome of *Agrobacterium* species which is transferred to the plant genome
 - plasmid DNA of *Agrobacterium* origin which is transferred to the plant genome**
 - DNA of plant origin transferred to bacteria

UNIT IV

61. Gene library made from genomic DNA
- cDNA library
 - Genomic library**
 - Phage library
 - Antibiotic library
62. cDNA library constructed only for
- Prokaryotes
 - Eukaryotes**
 - Chloroplasts
 - Mitochondria
63. Which of the following can be used to bound the poly(A) tail to recover the mRNA?
- Oligo (dT)**
 - Oligo (dA)
 - Oligo (dG)
 - Oligo (dC)
64. What is used in immunological detection methods?
- DNA
 - RNA
 - Antibodies**
 - oligonucleotides
65. The "Southern" technique involves:
- the detection of RNA fragments on membranes by specific radioactive antibodies.
 - the detection of DNA fragments on membranes by a radioactive DNA probe.**
 - the detection of proteins on membranes using a radioactive DNA probe.
 - the detection of proteins on membranes using specific radioactive antibodies.
 - the detection of DNA fragments on membranes by specific radioactive antibodies.

66. Complementary DNA or cDNA is made *in vitro* using the enzyme reverse transcriptase by using
- a. **mRNA** b. tRNA c. mt DNA d. plasmid DNA
67. Which refers to the process of immobilization of sample nucleic acids on solid support.
- a. **Blotting techniques** b. Affinity chromatography
c. Paper chromatography d. Fluorescent activated cell sorting
68. Vacuum blotting is a method of
- a. dry blotting b. wet blotting
c. **semidry blotting** d. none of the above
69. The DNA or RNA fragments which are used to recognize complementary sequences of DNA or RNA are referred to as
- a. cDNA probes b. **molecular probes**
c. RNA probes d. None of the above
70. What is the basis of nucleic acid hybridization technique.
- e. Formation of double helix from two non-complementary strands
f. Formation of single strand from two complementary strands
g. **Formation of double helix from two complementary strands**
h. Formation of single strand from complementary strands
71. The original method of blotting was developed by
- a. Gillespie b. Spiegelman
c. **Southern** d. Alwine
72. Which is the first blotting technique developed by
- a. **Southern blotting** b. Northern blotting
c. Western blotting d. Dot blotting
73. In blotting techniques, initially the membrane material used was
- a. Nylon membrane b. **Nitrocellulose membrane**
c. Whatmann filter paper d. Glass wool
74. For a nucleic acid probe to hybridize, which of the following must be true?
- a. The sequence to which it hybridizes must be identical to that of the probe.
b. **The sequence which it hybridizes must be complementary to the probe.**

- c. Both the probe and the sequence to which it hybridizes must be DNA.
 - d. Both the probe and the sequence to which it hybridizes must be RNA.
 - e. Neither the probe nor the sequence to which it hybridizes can contain introns.
75. Restriction endonuclease generated DNA fragments separated by gel electrophoresis and blot transferred onto a membrane filter are probed with a radioactive DNA fragment. This procedure is called:
- a. Gene cloning
 - b. **The Southern technique**
 - c. The polymerase chain reaction
 - d. Gene mapping
76. "Gene library" is a term used to describe:
- a. a computerized listing of known DNA sequences.
 - b. **bacteria with plasmids containing DNA fragments representing the majority of the genetic information from a plant or animal.**
 - c. a collection of books about recombinant DNA technology.
 - d. a compilation of the amino acid sequences of protein coding genes.
77. One of the most significant discoveries which allowed the development of recombinant DNA technology was:
- a. the discovery of antibiotics used for selecting transformed bacteria.
 - b. **the identification and isolation of restriction endonucleases permitting specific DNA cutting.**
 - c. the discovery of DNA and RNA polymerase allowing workers to synthesize any DNA sequence.
 - d. the development of the polymerase chain reaction.
78. Which are used to select genes of interest from a genomic library.
- a. Restriction enzymes
 - b. cloning vectors
 - c. **DNA probes**
 - d. Gene targets
79. A cDNA version of a gene includes
- a. **codons for a mature mRNA**
 - b. sequences corresponding to promoters
 - c. sequences corresponding to introns
 - d. both b and c
80. The DNA or RNA fragments which are used to recognize complementary sequences of DNA or RNA are referred to as
- a. cDNA probes
 - b. **molecular probes**

c. RNA probes

d. None of the above

UNIT V

81. β -glucuronidase activity produces

- a) **Blue colour** b) Green colour c) Black colour d) Yellow colour

82. 'RNAi' stands for

- a) RNA inducer b) RNA insertion c) **RNA interference** d) RNA intron

83. Which of the following technique used for forensic analysis of crime scenes and for paternity testing.

- a) **PCR** b) ELISA c) Enzyme assay d) Western blot

84. 10. Sanger's method of DNA sequencing also called as

- a) chain termination method b) dideoxy method
c) **both (a) and (b)** d) Chemical method

85. Which is important to understand the functions of genes, and basis of inherited disorders.

- a. DNA modeling b. **DNA sequencing**
c. DNA modification d. Autoradiography

86. The first DNA sequencing technique, using chemical reagents, was developed by

- a. Sanger and Nicholson b. Boyer and Cohen
c. **Maxam and Gilbert** d. None of the above

87. The preferred technique for determining nucleotide sequence in DNA is the one developed by

- a. Maxam b. Gilbert c. **Sanger** d. Willard

88. Dideoxynucleotide method is also called as

- a. **chain termination method** b. chain initiation method
c. chain activation method d. Chemical method

89. DNA sequencing in the recent years is carried out by

- a. Chain termination method b. Maxam and Gilbert method
c. **Automated DNA sequencer** d. Dideoxynucleotide method

90. Sanger method of sequencing requires which of the following as the starting material

- a. dsDNA b. **ssDNA** c. dsRNA d. ssRNA

91. The methods used to screen the clones from genomic library.

- a. Hybridization with probe b. Immunological screening
 c. Screening of protein activity d. **All the above**
92. RISC stands for
 a. **RNA induced silencing complex** b. RNA induced sequencing complex
 c. RNA inhibited sequencing complex d. RNA inhibited silencing complex
93. Marker gene from jelly-fish *Aequoria victoria*
 a. **GFP** b. luc
 c. GUS d. LacZ
94. Which technique employed by forensic scientists to assist in the identification of individuals by their respective DNA profiles.
 a. DNA profiling. b. genetic fingerprinting.
 c. DNA typing. d. **All of the above.**
95. Luciferase marker gene from bacteria
 a. *GFP* b. *luc*
 c. *GUS* d. *lux*
96. Luciferase marker gene from firefly
 a. *GFP* b. *luc*
 c. *GUS* d. *lux*
97. siRNA are produced by
 a. Transcription b. DNA damage c. RNA damage d. **Enzymatic action**
98. Dicer is
 a. DNase-like enzyme b. **RNase-like enzyme** c. an endonuclease d. an exonuclease
99. β -glucuronidase marker gene from
 a. **bacteria** b. plant c. jelly fish d. fire fly
100. Which of the following RNAs can induce gene silencing?
 a. **miRNA** b. snoRNA c. ssRNA d. ncRNA

SECTION – B (5 MARK)

UNIT I

1. What are the basic steps involved in gene cloning?
2. Enumerate the properties of ligases. Also, explain the mechanism of ligation.
3. What roles do restriction enzymes, vectors, and host cells play in recombinant DNA studies?
4. Compare and contrast Restriction enzyme Type I, II and III.
5. Define plasmids and its types.
6. Explain about DNA polymerases, Klenow fragment and Reverse transcriptases.
7. What is restriction and modification system?
8. Write short notes on the following:
 - a. Alkaline phosphatase
 - b. Homopolymer tailing
 - c. Terminal transferase
9. Write short notes on Restriction mapping.
10. Write short notes on type II & III restriction enzymes.

UNIT II

11. Write about shuttle vectors with example.
12. Write an account on SV-40 virus and its cloning strategy.
13. Write short notes on phagemids with example.
14. Give an account on the role of retrovirus as cloning vector.
15. Enumerate the properties of M13 vectors.
16. Write short notes on cosmid vector.
17. Write short notes on the λ Phage insertion and replacement vectors.
18. Write short notes on pUC vectors.
19. Explain the properties and construction of pBR322.
20. Give an account on Baculovirus vector and its applications.

UNIT III

21. Illustrate pET vector with its advantages.
22. How do fusion proteins aid in purification?
23. Explain *Agrobacterium* mediated transformation into plant cells.

24. Give an account on yeast episomal and integrative plasmid.
25. Write about 2 μ m plasmid of yeast and and replicative plasmid
26. Explain about BAC and its uses.
27. Discuss the problems involved in using *E.coli* is used as a cloning host for eukaryotic genes.
28. Explain the method of cloning strategy into YAC vectors.
29. Give an account on Gene cassette and fusion.
30. Write an account on Caulimo viruses, Gemni viruses as vectors

UNIT IV

31. Give a brief account on DNA probes.
32. Illustrate the steps involved in Northern hybridization.
33. Write short notes on Colony hybridization
34. Give an account on Southern hybridization
35. Write an account on Genomic library construction.
36. Explain about the different methods of labelling.
37. Illustrate the steps involved in RT-PCR.
38. Describe about the antibody based screening of cloned product.
39. Explicit the process of selection of clones by plaque hybridization.
40. Write about the procedure involved in Antibody based screening and Immunological tests.

UNIT V

41. Write short notes on Sanger's method of DNA sequencing
42. Write short notes on Maxam Gilbert method of sequencing.
43. Discuss the role of *gus* as marker gene in transgenic plants.
44. Detail about the use of *lux* and *luc* as marker gene
45. Detail about the use of *lacz* and *gfp* as marker gene
- 46.** Explain about the applications of DNA analysis in forensics and medicine.
47. Detail the process of miRNA biogenesis and repression of translation.
48. What are the uses of DNA sequencing.

49. Explain the process of RNA interference with illustration.
50. Discuss the role of DNA analysis in forensics and medicine.

SECTION – C (8 MARK.

UNIT I

1. Give an account on the DNA modifying enzymes and their properties.
2. Write the mode of action of DNA polymerases and terminal transferases.
3. Give a detailed account of Restriction endonucleases.
4. What are DNA enzymes? Discuss in detail their mode of action.
5. Give an account on the nomenclature of Restriction endonuclease Type II and Restriction mapping with Illustration.
6. Explain about Star activity, Isocaudomer, Neoschizomer, Isoschizomer and Write down the organism and restriction site for any 4 Type II restriction enzymes.
7. Detail the mechanism of *E. coli* and T₄ DNA ligases.
8. Write in detail about exonuclease and endonuclease
9. Write in detail about the tools used for rDNA technology.
10. Discuss about the characteristic features and problems in use of different plasmids and hosts for cloning in prokaryotes.

UNIT II

11. Elaborate about pUC series of vector with illustration.
12. Detail insertion and replacement vectors of lambda and its cloning strategy.
13. Write an essay on M13 based vectors with example.
14. Give an elaborate account on the genology of pBR322 and its advantages.
15. What are phagemid? Give a brief account of phagemids used as vectors.
16. Explain the properties and construction of artificial chromosomes.
17. Describe in detail about Binary and Shuttle vectors.
18. Write about the role of SV40 and Retero viral vectors in cloning in animals.
19. Illustrate the role of Baculo viral vectors in expressing foreign proteins in insect cell line.
20. Write in detail about the various steps in cloning using a cosmid vector.

UNIT III

21. List the advantages and disadvantages of using plasmids and YACs as cloning vectors.
22. Explain about yeast episomal, integrative and replicative plasmid in detail.
23. Discuss in detail the yeast plasmid vectors.
24. Explain the method of cloning strategy into BAC.
25. Give an illustrated account on gene cloning using Ti plasmid.
26. Give an account on the problems encountered in expression of recombinant proteins in *E.coli*.
27. Explain about cassettes, gene fusion and its advantages as expression vector.
28. Write about the properties of expression vectors and discuss with respect to prokaryotes.
29. Write about the role of Caulimo viruses, Gemni viruses in Transgenic plants.
30. Explain about the Agrobacterium mediated transformation in plants.

UNIT IV

31. What is hybridization? Explain in detail about DNA – DNA detection method.
32. Discuss in detail about gene library and its construction.
33. Explain how antibody based screening is done.
34. What are probes? How are they useful in screening methods?
35. Explain the construction of a genomic library with lambda and cosmid vectors.
36. Explain about the antibodies and immunological screening methods of cDNA libraries.
37. What is cDNA bank? How is they constructed using RT-PCR?
38. Describe about the process involved in Real time PCR and its applications.
39. Explain the process of selection of clones by plaque and colony hybridization.
40. Explain about the Southern and Northern hybridization technique and illustrate its similarities and difference.

UNIT V

41. What is DNA sequencing? Give a detailed account on Maxam-Gilbert method of DNA sequencing.
42. Detail about dideoxy method of DNA sequencing.
43. Detail about chemical method of DNA sequencing.
44. Detail about the use of *lux*, *luc* and *gfp* as marker gene with its mechanism.
45. Write an essay on the mechanism of miRNA technology involved in gene silencing.
46. Write an essay on the mechanism of siRNA technology involved in gene silencing.
47. Explain about the applications of DNA analysis in medicine and agriculture.
48. Compare and contrast about the mode of action and biogenesis of miRNA and synthesis of siRNA.
49. Write about the application of *gus* as marker gene in identifying the transgenic plants.
50. Discuss about the techniques involved in DNA analysis in forensics and to identify the paternity.

**SKILL BASED SUBJECT 3: - INFECTIOUS DISEASES,DIAGNOSTICS AND
HEALTH MANAGEMENT**

QUESTION BANK

ANSWER THE FOLLOWING: 1 MARK

1. Disease of a short-term is called as

a) **acute disease** b) acquired disease c) chronic disease d) genetic disease

2. In medicine, which is the functional abnormality or disturbance?

a) disease b) illness c) **disorder** d) all the above

3. Which is a diseased state, disability or poor health due to any cause?

a) mortality b) morality c) disorder d) **morbidity**

4. When a pathogen, a living microorganism such as bacteria and fungus enters the pathogen by

a) **direct transmission** b) indirect transmission c) both d) none of the above

5. Antibiotics are not effective against

a) bacteria b) **viruses** c) fungus d) actinomycetes

6. A fungus is often a

a) unicellular parasite b) **multicellular parasite** c) both d) none

7. Which is a protein that contains no genetic material?

a) virus b) virion c) **prion** d) viroid

8. Which is a larger, multicellular organisms that tend to be visible to the naked eye when fully grown?

a) **Helminths** b) ectoparasites c) Ringworms d) none

9. The human beings infected by pathogens that exist on or within the human body is called

a) **living reservoirs** b) non-living reservoirs c) animal reservoirs d) none

10. The study and analysis of the patterns, causes and effects of health and disease conditions in defined population is called

a) Epidemic b) endemic c) **epidemiology** d) none

11. The qualitative study of the experience of a single patient or small group of patients with a similar diagnosis is called

a) control studies **b) case-series studies** c) cohort studies d) none

12. Which is a retrospective study?

a) case-control studies b) case-series studies c) cohort studies d) none

13. The study of the subjects based on their disease status is called

a) case-control studies b) case-series studies c) cohort studies d) none

14. The study based on their exposure status is called

a) case-control studies b) case-series studies **c) cohort studies** d) none

15. How many components are there in observational studies?

a) one b) three **c) two** d) four

16. The distinction between epidemic and endemic is drawn by

a) Hippocrates b) Socrates c) Plato d) none

17. Epidemiology is a word derived from

a) Latin b) French c) Arabic **d) Greek**

18. The cornerstone of public health and shapes policy decisions and evidence based practice by identifying risk factors for disease and targets for preventive healthcare is called

a) Epidemic b) endemic **c) epidemiology** d) none

19. The spread of disease via air, drinking water and food as well as body fluids being handled outside the body is called

a) vehicle transmission b) vector transmission c) contact transmission d) none

20. Animals such as arthropods that transmit disease from one host to another is called as

a) vehicle transmission **b) vector transmission** c) contact transmission d) none

21. The infectious disease usually caused by the bacteria Mycobacterium tuberculosis is called

a) tuberculosis b) influenza c) syphilis d) gonorrhoea

22. Tuberculosis may infect any part of the body, but most commonly infect

a) Liver **b) lungs** c) pancreas d) heart

23. The most commonly used vaccine for TB is

a)**BCG** b)DPT c)TT d)none

24.The study of how biological viruses cause disease in their target host is called

a)virology **b)viral pathogenesis** c)viriology d)none

25.By which process does the invading virus reproduce itself in large numbers?

a)elongation b)termination **c)Replication** d)Initiation

26.The process by which an individual's immune system becomes fortified against an agent is called

a)immunization b)vaccination c)both d)none

27.The immunization that occur naturally when a person comes in contact with microbe is called

a)active immunization b)passive immunization c)both d)none

28.The immunization that occurs physiologically when antibodies are transferred from mother to foetus during pregnancy is called

a)active immunization**b)passive immunization** c)both d)none

29.The vaccines where microbes or microbial antigens are administered to produce humoral and/or cellular immune response, long or permanent protection is called

a)passive vaccine **b)active vaccine** c)attenuated d)none

30.The protection transferred from another person or animal is called

a)passive vaccineb)active vaccine c)attenuated d)none

31.The biological preparation that provides active acquired immunity to a particular disease is called

a)immunogen b)antigen **c)vaccine** d)haptan

32.The vaccine that contains live microorganisms is called

a)attenuated vaccine b)subunit vaccine c)conjugate vaccine d)none

33.The vaccines that is made from inactivated toxic compounds that cause illness rather than the microorganism is called

a)attenuated vaccine b)subunit vaccine c)conjugate vaccine **d)toxoid vaccine**

34.Rather than introducing an inactivated or attenuated microorganism to an immune system, a fragment of it can create an immune response is called

- a)attenuated vaccine **b)subunit vaccine** c)conjugate vaccine d)toxoid vaccine
- 35.Certain bacteria have polysaccharide outer coats that are poorly immunogenic is called
a)attenuated vaccine**b)subunit vaccine** c)**conjugate vaccine**d)toxoid vaccine
- 36.The combination of the physiology of one microorganism and the DNA of the other is called
a)Insertion vector b)Replacement vectors **c)recombinant vectors** d)none
- 37.The B-cell produce
a)antibodies b)antigen c)immunogen d)haptan
- 38.The T-cell bring about
a)humoral response **b)cell mediated response** c)both d)none
- 39.The B-cell brings about
a)humoral responseb)cell mediated response c)both d)none
- 40.The products derived from dead or inactivated microorganism or purified products is called
a)vaccine b)immunogen c)haptan d)epitope
- 41.Chicken pox is also known as
a)varicella b)variolla c)herpes d)none
- 42.Which is an airborne disease that spreads easily through the coughs and sneezes of an infected person?
a)influenza **b)chicken pox** c)TB d)HIV
- 43.In 2013, how many cases were affected by chicken pox and herpes zoaster worldwide?
a)140million b)120 million c)130 million d)150 million
- 44.Which virus causes chicken pox infection?
a)varicella zoaster virus b)variolla virus c)herpes virus d)influenza virus
- 45.Which is an acute inflammation of the protective membranes covering the brain and spinal cord?
a)chicken pox **b)meningitis** c)influenza d)obesity
- 46.The infection of the small intestine by some strains of the bacterium *Vibrio cholera* is

called

a)meningitis **b)cholera** c)chicken pox d)TB

47.Cholera is caused by

a)Vibrio cholera b)Mycobacterium tuberculosis c)s.typhi d)k.pneumoniae

48.Poliomyelitis is also called

a)polio b)infantile paralysis **c)both a and b** d)none

49.Poliomyelitis is highly contagious via the

a)fecal-oral b)oral-oral c)none of the above **d)both a and b**

50.Coronary heart disease refers to the

a) narrowing of the arteries b)narrowing of veins
c) enlarging of the arteries d)enlarging of the veins

51.Abbreviate CHD?

a)compact heart disease b)common heart disease
c)coronary heart disease d)cold humoral disease

52.CHD can lead to

a)shortness of breath b)enlargement of lungs
c)narrowing of arteries d)none

53.Hypertension is also known as

a)high blood pressure b)low blood pressure
c)common blood pressure d)both a and b

54.The hypertension that results from a complex interaction of genes and environmental factors is called

a)primary hypertension b)secondary hypertension
c)tertiary hypertension d)none

55.The hypertension that results from an identifiable cause is called

a)primary hypertension **b)secondary hypertension**
c)tertiary hypertension d)none

56. Ischemic stroke is divided into

- a) 3 types
- b) 4 types
- c) 2 types**
- d) 5 types

57. The infection when the blood supply to the brain is blocked by a blood clot or a clump is called

- a) meningitis
- b) cholera
- c) ischemic stroke**
- d) poliomyelitis

58. The group of metabolic disorders in which there are high blood sugar levels over a prolonged period is called

- a) Diabetes mellitus**
- b) meningitis
- c) poliomyelitis
- d) cholera

59. The diabetes characterized by insulin resistance is called

- a) type I
- b) type II**
- c) type III
- d) none

60. The medical condition in which excess body fat has accumulated to the extent that it may have a negative effect on health is called

- a) obesity**
- b) diabetes
- c) CHD
- d) polio

61. The procedure to confirm, or determine the presence of disease in an individual suspected of having the disease is done by

- a) diagnostic test**
- b) treatment
- c) symptoms detection
- d) none

62. The acetoacetate test is done for the specimen

- a) plasma**
- b) blood
- c) serum
- d) coagulant

63. The activated partial thromboplastin time is done for the specimen

- a) plasma**
- b) blood

85. The profession of educating people about health is called
a) health care b) health planning **c) health education** d) none
86. The first step in an orderly process to accomplish the things necessary to improve the health status of an individual and population is called
a) health care **b) health planning** c) health education d) none
87. Flankers call for the same response as the target and may appear identical is called
a) congruent stimulus b) incongruent stimulus c) neutral stimulus d) none
88. Flanker items call for the opposite response of the target and are represented by different symbols is called
a) congruent stimulus **b) incongruent stimulus** c) neutral stimulus d) none
89. Flanker items neither call for the same response nor evoke response conflict is called
a) congruent stimulus b) incongruent stimulus **c) neutral stimulus** d) none
90. Congruent stimulus is also called as
a) compatible condition b) incompatible condition c) both d) none
91. Incongruent stimulus is also called as
a) compatible condition **b) incompatible condition** c) both d) none
92. The cognition assessment was published the task in
a) 1974 b) 1977 c) 1987 d) 1990
93. The emotion assessment was published in the year
a) 1965 **b) 1962** c) 1967 d) 1978
94. The sensory system for the sense of taste is called
a) olfaction **b) gustation** c) audition d) pain
95. The sensory system for the sense of smell is called
a) olfaction b) gustation c) audition d) pain
96. The sensory system for the sense of hearing is called
a) olfaction b) gustation **c) audition** d) pain
97. The impairment of self-pity lead to the feeling of
a) Sadness b) shame c) anger d) gladness

98. The impairment of depression or perfectionism lead to the feeling of

a) Sadness b) shame c) **anger** d) gladness

99. The impairment of toxic shame lead to the feeling of

a) Sadness b) **shame** c) anger d) gladness

100. The impairment of happiness lead to the feeling of

a) Sadness b) shame c) anger d) **gladness**

Answer the following: 5 MARKS

1. Define human infections and its types?

2. Describe the transmission of diseases in populations?

3. Explain the spread of diseases in population?

4. Briefly write a note on the human reservoirs of infection?

5. Describe the modes of transmission of diseases?

6. Write the case control epidemiological studies of infections?

7. Define the non-living reservoirs of infection in humans?

8. Write a note on cohort epidemiological studies of infections?

9. Give a short note on the animal reservoirs of infections?

10. Briefly describe the animal and non-living reservoirs of infections?

11. Write a note on HIV with a neat diagram?

12. Describe about the sexually transmitted diseases-Gonorrhoea?

13. Write a note on Host defense mechanism?

14. Define the specific defense mechanism?

15. Explain the disease prevention and disease control?

16. With a neat diagram, explain the causes and symptoms of tuberculosis?

17. Write a note on the immunizing agents?

18. Write an account on the Indian vaccination table?

19. Write a note on Hepatitis?

20. Explain about the sexually transmitted disease-syphilis?

21. Briefly describe the clinical causes and symptoms of chicken pox?
22. Briefly describe the clinical causes and symptoms of Meningitis?
23. Briefly describe the clinical causes and symptoms of cholera?
24. Explain the epidemiology and treatment of poliomyelitis?
25. Explain the epidemiology and treatment of chicken pox?
26. Explain the epidemiology and treatment of Ischemic stroke?
27. Explain the epidemiology and treatment of obesity?
28. Briefly describe the clinical causes and symptoms of Hypertension?
29. Briefly describe the clinical causes and symptoms of Coronary heart disease?
30. Briefly describe the clinical causes and symptoms of Diabetes?
31. Write a note on the importance of laboratory diagnostic testing?
32. Explain the screening of the diagnostic testing?
33. Write the reliability of laboratory studies-sensitivity?
34. Write the reliability of laboratory studies-specificity?
35. Describe the normal and abnormal values and their meaning ?
36. Write a note on the high and low values in diagnostic testing?
37. Write a note on the subclinical and artefact values?
38. Give a note on the importance and screening of the diagnostic testing?
39. Briefly explain the false positive and false negatives values?
40. Explain the role of clinical laboratory tests in diagnosis?
41. Write a note on cognition assessment?
42. Give a note on the sensory assessment?
43. Explain the introduction about the health care management?
44. Describe a short note on health education?
45. Write an account on monitoring the health of populations?
46. Explain the health system in India?
47. Explain about the emotion assessment?

48. Write a note on Gustation and olfaction?
49. Explain the two sensory assessment-vision and audition?
50. Explain audition, pain and olfaction?

Answer the following; 8 MARKS

1. Explain the definition of human infection and types of disease?
2. Define the transmission of diseases in population in detail?
3. Define epidemiology and its types?
4. Describe in detail about the modes of infectious diseases?
5. Write an account on the reservoirs of infection in human?
6. Differentiate case control and cohort studies of infection?
7. Define the human and animal reservoirs of infection?
8. Define in detail about the spread of diseases in population?
9. Give an account on the types of diseases?
10. Explain in detail about the modes of infection of diseases?
11. Explain the clinical causes, symptoms and defense systems of Tuberculosis?
12. Explain the clinical causes, symptoms and defense systems of Influenza?
13. Explain the clinical causes, symptoms and defense systems of HIV?
14. Write a detailed note on viral pathogenesis and its control?
15. Give a note on the active and passive vaccines?
16. Explain the clinical causes, symptoms and defense systems of Gonorrhoea?
17. Define vaccines and its types in detail?
18. Briefly explain the Indian vaccination table?
19. Write a note on defense mechanism of infection?
20. Explain the clinical causes, symptoms and defense systems of Syphilis?
21. Explain in detail the clinical causes and symptoms of chicken pox?
22. Explain in detail the clinical causes and symptoms of coronary heart disease?
23. Explain in detail the clinical causes and symptoms of obesity?

24. Explain in detail the clinical causes and symptoms of Ischemic stroke?
25. Explain in detail the clinical causes and symptoms of poliomyelitis?
26. Write a note on the epidemiology and treatment of Diabetes?
27. Write a note on the epidemiology and treatment of Hypertension?
28. Write a note on the epidemiology and treatment of Cholera?
29. Write a note on the epidemiology and treatment of Meningitis?
30. Write a note on the epidemiology and treatment of poliomyelitis?
31. Explain the importance of diagnostic testing of infection?
32. Write a note on the screening of diagnostic testing of infection?
33. Describe in detail about the normal laboratory values of blood, plasma, serum, urine, CSF and stool?
34. Describe in detail about the abnormal laboratory values of blood, plasma, serum, urine, CSF and stool?
35. Explain in detail about the high and low normal and abnormal values?
36. Write a note on the subclinical and artefact values?
37. Give a note on the Inter-observer and Intra-observer variations?
38. Explain the reliability of laboratory studies?
39. Explain in detail about the sensitivity and specificity of laboratory studies?
40. Give an account on the artefact values?
41. Describe in detail about the cognition assessment?
42. Describe in detail about the emotion assessment?
43. Describe in detail about the sensory assessment?
44. Describe in detail about the Gustation and olfaction assessment?
45. Describe in detail about the vision, audition and pain?
46. Write an account on the health education?
47. Explain in detail about the health planning?
48. Describe in detail about the monitoring the health of populations?
49. Define the health system in India?

50. Write a note on the health care and management?

C.P. 10 - BIOPROCESS TECHNOLOGY

UNIT I

Section – A

1. A fed-batch process is a
 - a) Closed System
 - b) Continuous System
 - c) Intermittently fed System**
 - d) Biphasic System
2. Under steady state conditions specific growth rate is controlled by
 - a) Substrate concentration
 - b) Growth limiting substances
 - c) Dilution rate**
 - d) None of the above
3. Continuous fermentation is used in the production of
 - a) Beer
 - b) Antibiotic
 - c) Vinegar
 - d) Lactic acid**
4. In primary screening, microorganisms are capable of producing
 - a) Organic acid
 - b) Amino acid**
 - c) Proteins
 - d) Gases
5. The crowded plate techniques is the simplest screening method that detects and isolates
 - a) Growth factor
 - b) Antibiotic producers**
 - c) growth inhibitors
 - d) stock culture
6. A culture system with constant environment conditions maintained through continual provision of nutrient and removal of wastes is called _____ culture system
 - a) Continuous**
 - b) Batch
 - c) Fed- batch
 - d) Semi continuous
7. Yield coefficient represents
 - a) The total biomass or product produced**
 - b) Conversion efficiency of substrate into product
 - c) Conversion rate of substrate into product or biomass
 - d) Production time of biomass or product
8. Diauxie is
 - a) Growth factors
 - b) Microbiological die off
 - c) Simultaneous uptake of nutrients
 - d) Stage wise uptake of nutrients**
9. The importance of yeast extract in the industrial fermenter is act as
 - a) Vitamins**
 - b) Nitrogen source
 - c) Carbon source
 - d) Carbon and Vitamin source
10. The isolation process should be started in _____ culture using a _____% inoculum
 - a) Batch, 40%
 - b) Continuous, 40%
 - c) Batch, 20%**
 - d) Continuous, 40%
11. _____ is a technique resulting in an increase in the number of a given organism relative to the number of other types in the original inoculum
 - a) Enriched culture
 - b) Entangled culture
 - c) Enhanced culture
 - d) Enrichment culture**
12. The overall production of product improved by
 - a) Genetic modification of microbes
 - b) Changes in medium composition
 - c) Both A and B**
 - d) None of the above
13. Auxotrophic mutant of *C. glutamicum* produce glutamate under the condition of
 - a) Biotin rich**
 - b) Biotin limited
 - c) Optimum level of biotin
 - d) Both a and b
14. The oxygen transfer rate in a bioreactor will increase if
 - a) Oil is used
 - b) Antifoam**
 - c) Detergent like molecules
 - d) Increase reactor temperature
15. Lyophilization is achieved by
 - a) Freezing by -20°C
 - b) Sublimation of cell water**
 - c) Freezing by liquid nitrogen
 - d) Cryoprotective agents
16. _____ cryoprotectant is used before submerging the ampoules for cryopreservation
 - a) Asbestos
 - b) Nutrient agar
 - c) Glycerol
 - d) Liquid nitrogen**
17. In bioprocess yield factor is used to predict the

3. Which part of the fermentor is designed to prevent vortexing
a) Agitator b) Sparger c) Mechanical seal **d) Baffles**
4. What is added to prevent foam formation
a) Glucose **b) Flocculant** c) Silicone d) Coagulant
5. Use of sparger
a) Aeration b) pH c) Temperature d) Purification
6. The fermentor in which the liquid is recirculated by the density differences between the gassed and ungassed section of the equipment
a) Packed bed b) CSTR **c) Airlift** d) Batch
7. Function of draft tube in an airlift bioreactor
a) To reduce bubble coalescence b) To improve circulation
c) To even out shear condition **d) All of the above**
8. _____ and _____ are the two pleated structures found in the air filters
a) Zig-Zag, Bristle b) Star, Ultri **c) Spear head, long** d) Continuous, batch
9. Another name of tower fermentors
a) CSTR b) Packed bed **c) Airlift** d) Batch
10. What is used to reduce vortexing
a) Impeller **b) Baffles** c) Agitator d) pH
11. Membrane fermentors are used for _____
a) Immobilized cells b) Animal cell culture **c) Waste water treatment** d) All the above
12. Which type of reactor, aeration is generally accomplished in a separate vessel?
a) Fluidised bed b) Trickle bed c) Packed bed **d) Stirred and air-driven reactors**
13. Reactor in which a fluid is passed through a granular solid material at high velocity enough velocities to suspend the solid and cause it to behave as though it were a fluid
a) Fluidized bed b) Trickle bed c) Packed bed d) Bubble column
14. Bubble column reactor cannot be used for
a) Highly viscous medium b) Low viscous medium
c) Solid state medium d) Liquid state medium
15. Medium Rheology is
a) Medium flow characteristics b) Air flow characteristics
c) Mass flow characteristics d) Liquid flow characteristics
16. The degree of agitation affects in fermentation process except
a) It increases the contact time for bubbles in the medium
b) It plays a vital role in the oxygen transfer rate in agitated fermenter
c) It influences coalescence of air bubbles
d) It decreases thickness of liquid film at gas-liquid interface
17. In fermenter the top portion left without broth is called
a) Shaft **b) Headspace** c) Impeller d) Sparger
18. Which of the following impellers are used for range of viscosities
a) Paddles b) Turbines **c) Propellers** d) None of these
19. Which of the following is/are non mechanically agitated reactors
a) Stirrer tank b) Bubble c) Airlift reactor **d) both b & c**
20. The range of width for the baffle in the fermenter is _____ times of vessel diameter
a) 1/10 to 1/12 b) 1/8 to 1/10 c) 1/5 to 1/8 **d) none of these**

Key to Section A

1. c	2. a	3. d	4. b	5. a	6. c	7. d	8. c	9. c	10. b
11. c	12. d	13. a	14. a	15. a	16. b	17. b	18. c	19. d	20. d

Section – B

1. Explain about construction materials used for body of fermenter
2. Write a note on different types of impellers
3. Write a Brief notes on airlift bioreactor with neat diagram
4. Write in short about the CSTR
5. How the photo bioreactor system functioning
6. Discuss about packed bed bioreactor
7. Write short note on bioreactors for immobilized cells
8. What is the function of bioreactors
9. Write a short note on design of bioreactors
10. What is the use of pulsed bioreactor

Section – C

1. Explain about basic designing and construction of fermentor
2. What is meant by aseptic operation of fermenter? Explain the categorization of process in microorganism
3. Explain the following reactor with neat diagram
 - i) Stirred tank reactor
 - ii) Airlift fermenters
 - iii) Packed bed
4. What are the use of the following in the bioreactors
 - i) Sampling port
 - ii) Baffles
 - iii) Feed port
 - iv) sensor probes
5. Write a brief notes on batch and CSTR with illustration
6. Give a detailed account on air and components of bioreactors
7. Briefly explain about bioreactors for waste water treatment with illustration
8. Explain about bioreactors for animal cell culture
9. Briefly explain about specialised bioreactors of pulsed, fluidized and photobioreactor
10. Write an brief note on bioreactors for effluent treatment

UNIT III

Section – A

1. Which of the following is an upstream process
 - a) **Media formulation**
 - b) Product recovery
 - c) Product purification
 - d) Cell lysis
2. The micro-organism useful for fermentation are
 - a) Bacteria
 - b) **Yeast**
 - c) Fungi
 - d) None of these
3. Basic principle in industrial microbiology is
 - a) Suitable growth conditions
 - b) Fermentation
 - c) Providing aseptic conditions
 - d) **All of these**
4. Antifoam agent is
 - a) Silicon compounds
 - b) Corn coil
 - c) Soyabean oil
 - d) **All of the above**
5. For the production of ethanol the raw material used is
 - a) Molases
 - b) Cellulose
 - c) **Sulphite waste liquor**
 - d) None of these
6. Carbon sources used in media formulation are following except
 - a) Carbohydrates
 - b) Oils and fats
 - c) Hydrocarbons
 - d) **Peptones**
7. Ammonia, ammonium salts, and urea are the most commonly used sources in the fermentation process.
 - a) Carbon
 - b) Enzyme
 - c) **Nitrogen**
 - d) Minerals
8. Which of the following influence Heat sterilization of media

- a) Number of organisms b) Kind of organisms c) Type of media **d) All of the above**
9. 'Del Factor' is represented as
 a) $\ln N_0/N_t$ **b) $A. e^{-E/RT}$** c) E/RT^2 d) kN
10. Which of the following organism is used as Design organism for sterilization program
 a) *B. amyloaqueficiens* b) *B. anthrax* c) ***B. stearotherompilus*** d) *T. Aquaticus*
11. Continuous sterilization is better over Batch sterilization due to
 a) Protection of nutrient value b) Easier automatic control
 c) Decrease in sterilization time **d) All of the above**
12. Sterilization process in industry is designed for
 a) Only killing all microbes **b) Killing microbes with desired nutrient value**
 c) Sterilization with minimum chance of contamination d) All of the above
13. Which is the best suitable method for sterilization of fermentor and pipe works
 a) Filter Sterilization **b) Heat Sterilization** c) Chemical sterilization d) All of the above
14. Batch sterilization cycle time consists of
 a) **Two phases** b) Three phases
 c) Four phases d) Five phases
15. Which of the following influence heat sterilization of media
 a) Number of organism b) Kind of organism
 c) Type of media **d) All of the above**
16. Indirect heat exchanger stream is injected to
 a) Direct contact with medium **b) Exchanging heating plate**
 c) Both A and B d) None
17. _____ is the process of early cell isolation, cultivation and harvest cells
 a) **Upstream** b) Downstream c) Both a and b d) None of the above
18. Sterilization process by maintaining 140°C for 30-120 seconds
 a) Batch sterilization **b) Continuous sterilization** c) pasteurization d) Autoclave
19. Inertial impaction removes particles more efficiently in
 a) Liquid **b) Air** c) Solid d) All the above
20. Main aim of inoculums preparation
 a) To minimize contamination b) To increase production
 c) **To decrease lag phase** d) All the above

Key to Section A

1. a	2. b	3. d	4. d	5. c	6. d	7. c	8. d	9. b	10. c
11. d	12. b	13. b	14. a	15. d	16. b	17. a	18. b	19. b	20. c

Section – B

1. Give short notes on principles of microbial nutrients
2. Write about one of the major constituent of media formulation
3. How to formulate media?
4. Write in brief about precursors and inhibitors
5. Discuss about Air sterilization
6. Discuss about media optimization for fermentation
7. Detail about the development of inoculums for fermentation
8. How will you maintain aseptic condition in a fermentor
9. Write the advantages of sterilization in batch and continuous process
10. Explain about scale up and scale down process

Section – C

1. Give an overview on upstream processing
2. Explain in brief about media formulation and its essential features
3. Write about various considerations to be followed for media preparation and optimization
4. Explain the batch and continuous sterilization process in details
5. Write in brief about sterilization of a bioreactor and its components
6. Give a detailed account on aseptic operation of fermentor
7. Inocula development in bioprocess technology – explain in detail
8. Briefly explain about air sterilization in fermentation process
9. Explain in detail about design of air filters
10. Discuss about various steps involved in scale up and scale down process

UNIT IV

Section – A

1. Which of the following is a downstream process
a) Screening **b) Product recovery** c) Sterilization of media d) Inoculum preparation
2. Cell lysis becomes an important operation if the product is
a) Extra cellular b) Heat labile c) Toxic **d) Intracellular**
3. Which of the following factor increase the difficulties of products recovery
a) pH of the medium **b) Cell fragments, soluble and insoluble medium components**
c) Only cell fragments c) d) only insoluble medium components
4. Precipitation is done by
a) PEG(polyethylene glycol) b) Triazine dyes
c) Ammonium and sodium sulphate **d) All of the above**
5. If the product formed is extracellular then the method which is not used is
a) Reverse osmosis b) Ultra filtration c) Chromatography **d) Freeze thawing**
6. Which process uses a porous medium for the separation of the solid material from gas or liquids?
a) Precipitation **b) Filtration** c) Centrifugation d) Foam separation
7. Which filter consists of alternately arranged plates and frames where frames are fitted with filter cloth or filter pad?
a) Plate & Frame Filter b) Pressure leaf filter c) Rotary vacuum filter d) Metafilter
8. Meta filter is an example of
a) String discharge b) Scraper discharge
c) Scraper discharge with precoating of the drum **d) Stacked leaf filter**
9. Which is not an example of Rotary vacuum filter?
a) String discharge b) Scraper discharge
c) Scraper discharge with precoating of the drum **d) Vertical metal-leaf filter**
10. Which is an example of Pressure leaf filter?
a) String discharge b) Scraper discharge
c) Scraper discharge with precoating of the drum **d) Vertical metal-leaf filter**
11. Plate and frame filter is a type of
a) Batch filtration b) Continuous filtration c) Both of above d) None of above
12. Cross flow Filtration consist of:
a) A media storage tank b) A pump c) A system of packs of membrane **d) All of these**
13. Which centrifuge contains perforated bowls with a filter bag of nylon or cotton?
a) Basket centrifuge b) Tubular-bowl centrifuge
c) Multi chamber centrifuge **d) Disc-bowl centrifuge**

UNIT V

Section – A

1. The word ‘beverage’ has derived from
a) French **b) Latin** c) Greek d) Arabic
2. The odourless liquid obtained through the fermentation of a sugar containing liquid is called
a) Wine **b) Alcohol** c) Beer d) Spirits
3. Wine is an alcoholic beverages obtained from thee fermentated juice of freshly harvested
a) cabbage b) orange **c) grapes** d) all of the above
4. Beer is produced by the saccharification of
a) Glucose b) maltose c) fructose **d) starch**
5. The water content in beer is
a) 80-90% b) 90-99% **c) 89-91%** d) 80-92%
6. Vitamin B12 is also known as
a) cobalamin b) albumin c) transferrin d) fibronectin
7. The effects of vitamin B12 is seen in
a) blood b) nervous system c) skin **d) both a and b**
8. Amylase are enzymes that causes the hydrolysis of _____ into sugars
a) starch b) glucose c) fructose d) maltose
9. Which amylase is important in brewing in beer and liquor made from sugars derived from starch?
a) alpha amylase b) beta amylase c) gamma amylase **d) both a and b**
10. Amylases are used in making
a) cake making **b) bread making** c) biscuit making d) none of the above
11. A protease is also called as
a) peptidase b) proteinase **c) both a and b** d) none
12. Some proteases are less active after autolysis is called as
a) trypsinogen b) Withaniacoagulans c) pepsin **d) TEV protease**
13. Penicillin is an antibiotics against the bacterial infection caused by
a) k.pneumoniae b) staphylococci c) streptococci **d) both b and c**
14. Penicillin was discovered in
a) 1930 b) 1931 **c) 1928** d) 1929
15. The term penicillin is often generically refer to
a) benzylpenicillin b) procaine benzylpenicillin c) phenoxymethylpenicillin **d) all the above**
16. Streptomycin was discovered in
a) 1943 b) 1942 c) 1940 d) 1941
17. Streptomycin was obtained from
a) *Streptococcus* b) *staphylococcus* **c) *Streptomyces griseus*** d) All the above
18. Viticulture refers to the growing of
a) orange b) apple c) lemon **d) grapes**
19. Vintage is the
a) growing of grapes b) seedling of grapes c) ploughing **d) plucking of grapes**
20. The process of removing pulp and yeast particles from wine is called
a) finning **b) racking** c) refrigeration d) filtration

Key to Section A

1. b	2. b	3.c	4. d	5. c	6.a	7. d	8. a	9. d	10. b
11. c	12. d	13. d	14. c	15. d	16. a	17. c	18. d	19. d	20. b

Section – B

1. Explain the production of beer?
2. How is the fermentation process in monitored?
3. Give a note on wine production?
4. Write in short about the organic acids?
5. Explain the methodology of the preparation of acetic acid?
6. Explain about basic steps involved in citric acid preparation?
7. Explain about ethanol-the organic solvents?
8. Explain about amylase production?
9. Discuss about protease and its production?
10. Discuss about the amino acid-Glutamic acid?

Section – C

1. Write in detail about various alcoholic beverages?
2. Explain in brief the organic acids and its production with one example?
3. Explain about the ethanol production and its uses?
4. Explain about Antibiotics with an example?
5. Write a note on penicillin?
6. Discuss in detail about penicillin and streptomycin?
7. Briefly explain about Vitamin B12?
8. Write an essay on amino acids and its production?
9. Briefly explain about beer production in industry?
10. Write an essay on wine production through Bioprocess technology?