R5704

Sub. Code 501201

M.Sc. DEGREE EXAMINATION, APRIL - 2021

Biotechnology

Second Semester

GENETIC ENGINEERING

(CBCS-2020 onwards)

Time: 3 Hours Maximum: 75 Marks

Part - A **(30 x 1 = 30)**

Answer all questions

1. DNA ligase functions by adding _____ bonds to the DNA

a) Phosphodiester b) Oxygen

c) Hydroxyl d) Carbon

2. The semi conservative replication model was shown first in _____

a) Homo sapiens b) Escherichia coli

c) Drosophila melanogaster d) Salmonella typhimurium

3. Klenow enzyme is formed from

a) RNA polymerase b) DNA polymerase I

c) DNA polymerase II d) DNA polymerase III

4. What does Bt mean in Bt-cotton?

a) Biotechnology b) Biotech

c) Bacillus thuringiensis d) Bacillus technology

5. Genetically engineered human insulin is _____

a) Haemoglobin b) Humulin

c) Calcitonin d) Calcineurin

6. Southern blot is a technique for the detection of _____

a) Specific DNA
b) Specific protein
c) Specific RNA
d) Specific lipid

7. Ri plasmid is from _____

a) Agrobacterium rhizogenes
b) Agrobacterium tumefaciens
c) Agrobacterium radiobacter
d) Thermusaquaticus

8. For DNA having 20 % cytosine in one strand what is the percentage of adenine?

a) 20 %
b) 30 %
c) 40 %
d) 50 %

9. Length of siRNA is

a) 10-12 bp
b) 20-25 bp
c) 30-35 bp
d) 40-45 bp

10. What is Cas9?

a) an RNA molecule that binds to target DNA via complementary base pairing
b) a DNA sequence that binds the Cas9 protein
c) a viral protein that disrupts bacterial membranes
d) a protein enzyme that cuts both strands of DNA at sites specified by an RNA guide.

11. The vector which is double stranded, extra chromosomal and circular is _____

a) Cosmid
b) Plasmid
c) Phagemid
d) Bacterial vector

12. The equipment for introducing DNA into cells using micro projectiles is _____

a) DNA probe
b) Gene gun
c) Lyophilizer
d) UV Spectrophotometer

13. Animal that has received foreign DNA is termed _____

a) chimeric b) alien

c) transgenic d) extinct

14. A molecular technique in which DNA sequences between two oligonucleotide primers can be amplified is known as _____

a) Southern blotting b) Northern blotting

c) Polymerase chain reaction d) Western blotting

15. A chimera is

a) An enzyme that links DNA molecules b) A plasmid that contains foreign DNA

c) A virus that infects bacteria d) A fungi

16. Which of the following DNA binding proteins interacts with DNA in a sequence specific manner?

a) Histone H3 b) DNA polymerase

c) Helicase d) RNA polymerase

17. DNA fingerprinting uses the _____

a) difference in pattern of genes b) difference in order of genes

c) similarity in number of genes d) difference in junk DNA patterns

18. Fusion of karyoplast with the enucleated cell is by _____

a) polyethylene glycol b) cytochalasin B

c) ethanol d) eosin

19. Transfection

a) Synthesis of mRNA from DNA b) Synthesis of protein from mRNA

c) Introduction of foreign gene in to a cell d) Process of cell becoming malignant

20. Chromosomes may be isolated from metaphase cells by

a) hypertoniclysis b) hypotoniclysis

c) isotoniclysis d) incubating in saline

21. A DNA vaccine is

a) A DNA molecule that is recognized by an antibody

b) A vaccine that works by stimulating the immune system to recognize pathogen DNA sequences

c) A vaccine that is administered as DNA; the DNA is then expressed to produce a protein, which stimulates an immune response.

d) A DNA molecule that binds and inactivates viral DNA

22. Which of the following is used to clone large pieces of DNA?

a) M13 b) lambda phage

c) Agrobacterium d) YAC

23. The cloned DNA fragment size of phagemid vector is _____

a) 1 kb b) 10 kb

c) 1500 b d) 50 kb

24. Sequences that act as origin of replication are _____

a) partial replicating sequences b) self replicating sequences

c) autonomously replicating sequences d) modified replicating sequences

25. In transgenic fish, the genes are introduced by

a) microinjection b) viruses

c) transfer of whole nuclei d) breeding

26. The DNA fingerprint pattern of a child will be _____

a) Exactly similar to parents b) 100% similar to father's

c) 100% similar to mother's d) 50% similar to father and mother each

27. Father of genetics

a) MS Swaminathan b) George Kurian

c) Mendel d) Morgan

28. Selective degradation of single stranded DNA can be achieved by using _____

a) nuclease b) S1 nuclease

c) protease d) doxy ribonuclease

29. A collection of many clones possessing different DNA fragments from the same organisms bound to vectors

a) genomic library b) Seed bank

c) species d) genus

30. Which type of restriction endonuclease cuts the DNA within the recognition site?

a) Type I b) Type II

c) Type III d) Type IV

Part - B **(10 x 2 = 20)**

Answer any ten questions.

31. How sticky ends are formed?
32. What are radioactive probes?
33. What do you mean by nick translation?
34. What are cosmids?
35. What are YACs?
36. What is multiplex PCR?
37. What are T-vectors?
38. What is automated DNA sequencing?

39. What is the difference between transfection and transformation?

40. What is biolistics?

41. What is FlavrSavr?

42. What is golden rice?

Part - C **(5 x 5 = 25)**

Answer any five questions.

43. Explain southern blotting.

44. Explain colony hybridization.

45. What is affinity chromatography?

46. What is nested PCR?

47. What is the chemical method of DNA sequencing?

48. Explain in detail about gene therapy.

49. How will you edit a gene using CRISPR technology?

50. How will you determine the region of DNA to which a protein is suspected to bind?

_____

R5705

Sub. Code 501202

M.Sc. DEGREE EXAMINATION, APRIL - 2021

Biotechnology

Second Semester

IMMUNOLOGY

(CBCS-2020 onwards)

Time : 3 Hours Maximum : 75 Marks

Part – A **(30 x 1 = 30)**

Answer all questions.

1. The B and T cells producing hematopoietic stem cells are formed in:

a) Spleen
b) Bone marrow
c) Liver
d) Circulatory system

2. The most effective immune cells/molecules destroying intracellular pathogens are

a) T helper cells
b) B cells
c) T cytotoxic cells
d) Complement

3. The following is not a part of mononuclear phagocyte system

a) Monocytes
b) Endothelial cells
c) Lymph node medullary macrophages
d) Kidney mesangial cells

4. The following is not a characteristic feature of neutrophil defensins

a) Anti-toxins
b) Oxygen-dependent
c) Enzymes
d) Peptide antibiotics

5. The immunoglobin's complementarity determining region

a) Are restricted to light chains
b) Are concerned in antigen recognition
c) Bind to Fc receptors
d) Are in the constant part of the Ig molecule

6. B-cell shows the ability of making cell-surface and secreted versions of antibody since it uses

a) Different gene pools

b) Differential splicing

c) Different light chain class but the same heavy chain

d) Different heavy chain class but the same light chain

7. The molecules mediating signal transduction following antigen binding to cell surface immunoglobulin on a B-cell are called

a) Ig-alpha and Ig-beta

b) MHC

c) CD4

d) CD8

8. Which of the following determines idiotype of an antibody?

a) Variable region of heavy chain

b) Hinge region

c) Fc region

d) CDRs of light and heavy chain

9. A hapten is

a) An epitope which is in contact with a combining site of a single antibody

b) A paratope, a part of the antibody surface which is in contact with the antigen

c) The chemical grouping in reacts with performed antibodies including that on the specific B-cell surface but cannot induce an antibody response

d) Produced by amino acid residues on non-adjacent polypeptide sequences

10. The MHC class I heavy chain consists of

a) Beta2-microglobulin

b) Three Ig-type domains

c) Two globular domains

d) Three globular domains

11. Which of the following is a vasoactive amine released upon degranulation of mast cells and is responsible for many of the symptoms of type I hypersensitivity?

    a) Sodium cromoglycate
    b) Histamine
    c) anti-IgA monoclonal antibody
    d) Eosinophil chemotactic factor (ECF)

12. Di George syndrome the inability of stem cells to differentiate and mature to T-cells results from a defect in

    a) Purine nucleoside phosphorylase
    b) Wiskott–Aldrich syndrome protein (WASP)
    c) Thymic development
    d) CD3

13. Tissue nodule containing proliferating lymphocytes, fibroblasts, and giant cells/epithelioid cells which forms because of inflammation in response to chronic infection is

    a) granuloma
    b) hepatocyte
    c) lymphoma
    d) erythroblastoma

14. The following accounts for the SCID cases

    a) RAG-1/RAG-2 defect
    b) ADA and JAK-3 gene
    c) γ chain mutatations
    d) all the above

15. Which of the following is NOT helpful in the diagnosis of AIDS?

    a) CD4 numbers
    b) CD8 numbers
    c) Skin tests to bacterial antigens
    d) Lymph node biopsy

16. The human monoclonal antibodies can be obtained

    a) Using Epstein-Barr virus immortalization of T-cells
    b) Easily from human hybridomas selected with HT medium
    c) Using transgenic xenomouse strains
    d) Only by fusing human B-cells with mouse myeloma cells

17. The direct conjugate of antibody used for visualizing tissue antigens is

a) Fluorescein
c) Hapten
b) Anti-immunoglobulin
d) Immunoglobulin

18. ELISA uses an antigen or antibody labeled with

a) 125I
c) FITC
b) Horseradish peroxidase
d) Europium 3+

19. How many types of antibodies are there?

a) 2
c) 4
b) 3
d) 5

20. T-cells characterization ELISPOT employs Ig labelled with

a) Enzyme
c) Dye
b) Fluorescent molecule
d) Radioactive isotope

21. Which of the following cells is involved in cell-mediated immunity?

a) T cells
c) neurons
b) B cells
d) Mast cells

22. Maternal antibody gets transferred across the placenta from the mother to the fetus is?

a) IgA
c) IgE
b) IgG
d) IgM

23. Natural killers cells are found in all of the following except

a) Blood
c) Lymph nodes
b) Thymus
d) Spleen

24. Fusion between a plasma cell and a tumor cell creates a _____

a) Lymphoblast
c) Lymphoma
b) Hybridoma
d) Myeloma

25. Radioimmunoassay (RIA) uses the following

a) 125I
c) Europium 3+
b) FITC
d) Horseradish peroxidase

26. The fluorochrome which emits green fluorescence when excited by UV light used in immunofluorescence (IF) assay is

a) FITC
c) Horseradish peroxidase
b) Europium 3+
d) rhodamine

27. Which of the following molecule cannot be detected by ELISA?

a) proteins
c) antibodies
b) hormones
d) DNA

28. The major advantage of ELISA over the other biological quantification techniques is

a) detection of a molecule at a low concentration
c) low specificity
d) easily available
b) inexpensive

29. Monoclonal antibodies recognize a single _____

a) Antigen
c) Bacterium
b) Virus
d) Epitope

30.Cytokine involved in increasing the body temperature is _____

a) IL 6
c) IL 2
b) IL 5
d) IL 3

Part – B **(10 x 2 = 20)**

Answer any ten questions.

31. What are pathogen recognition receptors?

32. What is mucosal immunity?

33. What are antigenic determinants?

34. What is immunological memory?

35. What is ELISA?

36. What do you mean by apoptosis?

37. Write a note on edible vaccines.

38. What are hybrid monoclonal antibodies?

39. What is hypersensitivity?

40. What is anaphylactic shock?

41. Give note on the mRNA vaccine for CoVID-19.

42. Which protein is the antigen selected for producing Corona virus vaccine? What is the reason behind it?

Part - C **(5 x 5 = 25)**

Answer any five questions.

43. What is humoral immunity. Explain in detail about the humoral immune response?

44. What are haptens. Explain in detail about their immunological significance?

45. Describe in detail about classical pathway of complement.

46. What are autoimmune diseases? List out the different classes of autoimmune diseases with their causatives.

47. Give an account on the different types of vaccines with example.

48. What is ELISA? Explain in detail about its different types and application.

49. What is antibody diversity? Explain in detail about the various factors contributing for generation of antibody diversity.

50. Explain how dose regimen is designed for a viral vaccine with example.

R5706

Sub. Code 501203

M.Sc. DEGREE EXAMINATION, APRIL - 2021

Biotechnology

Second Semester

BIOINFORMATICS

(CBCS - 2020 onwards)

Duration: 3 Hours **Maximum: 75 Marks**

Part-A **(30 x 1=30)**

Answer all questions

1. Which of the following is NOT a part of UNIX operating system?

a) Kernel b) Shell c) Commands and Utilities d) GUI

2. The given below sequence is in which format

>d2i9da_ c.43.1.0 (A:) automated matches {Bacteroides thetaiotaomicron}

KQIIDIENWERKENFNFFRHFQNPQLSITSEVECGGARQR

a) EMBL b) NBRF c) FASTA d) PIR

3. To find the required protein sequence information quickly, the user should enter the _____.

a) sequence deposition date, protein name and journal name

b) sequence accession number, protein name, or name of gene

c) publication date, protein name, or volume

d) properties, protein name, or title word

4. Which database is a collaboration between the European Bioinformatics Institute (EMBL-EBI), the Swiss Institute of Bioinformatics (SIB) and the Protein Information Resource (PIR)?

a) TrEMBL b) Prosite c) NCBI d) UniProt

5. The expansion of structural database PDB is

a) Protein Data Base b) Protein Derived Base

c) Protein Data Bank d) Protein Derived Bank

6. To change their login password in UNIX, which of these below command is used?

a) man b) reset c) passwd d) cp

7. Homologs produced by gene duplication is

a) Orthologs b) Paralogs c) Xenologs d) Analogs

8. The researchers use the sequence alignment concept

a) to trace out evolutionary relationship

b) to infer the functions of newly sequenced genes

c) to predict new members of gene families

d) all the above

9. Which one of the following database is maintained by NCBI?

a) SwissPROT b) GenBank c) Pfam d) SCOP

10. In sequence similarity search, which of the following two matrices are suitable for short sequences that are highly similar (70-90%).

a) PAM 40 and BLOSUM 90 b) PAM 90 and BLOSUM 80

c) PAM 250 and BLOSUM 30 d) PAM 160 and BLOSUM 62

11. What is the length of a motif, in terms of amino acids residue?

a) 70- 90 b) 30- 60 c) 10- 20 d) 1- 10

12. In prokaryotic organisms, the gene identification is easy because of the lack of _____

a) exons b) introns c) coding segments d) useful nucleotide sequences

13. In a CLUSTALW, multiple alignment ':' represents

a) Strongly conserved regions b) Non conserved regions

c) Gapped regions d) None of the above

14. An open reading frame (ORF) is

a) the sequence of a complete genome

b) a plasmid vector used in genome sequencing

c) a possible gene predicted by DNA sequencing

d) none of the above

15. Which of following program(s) is/are used to submit the entire genome with feature annotation in NCBI, which can be processed in seconds

a) Sequin b) tbl2asn c) both (a) & (b) d) None of these

16. The user can perform overlapping or replacing the sequence in an existing sequence record by using _____ function in Sequin program of NCBI.

a) overlap sequence b) modify sequence c) replace sequence d) update sequence

17. Which one of the following is not the phylogenetic analysis tool?

a) CLUSTAL-TREE b) TREE-PUZZLE c) PAUP d) MEGA

18. The phylogenetic analysis is more difficult for the sequences that have _____

a) no divergence b) considerable divergence c) both (a) & (b) d) None of these

19. Hydrogen bonds are fundamentally _____ interaction.

a) electrostatic b) van der Waals c) covalent d) both (b) & (c)

20. The problem of predicting the 3-dimensional protein structure of a given sequence of aminoacids is called _____ problem.

a) structure b) function c) protein folding d) sequence

21. The atom which is less tightly linked to the hydrogen atom is called hydrogen-bond _____.

a) donor b) acceptor c) promoter d) receptor

22. Which of the following amino acids are the helix breakers?

a) Proline/Glycine b) Leucine/Isoleucine c) Valine/Proline d) Glycine/Valine

23. Which of the following is a 3-D molecular visualization tool?

a) BLAST b) Rasmol c) Bioedit d) PDB

24. The _____ compounds are frequently _____ in adapting their shape to fit the receptor binding pocket in protein-ligand docking.

a) small molecule, less flexible b) large molecule, highly flexible

c) large molecule, more flexible d) small molecule, highly flexible

25. The Pfizer's rule of five (Lipinski's rule of five) is used for assessing the _____ of the small molecules

a) Docking b) Similarity search c) Drug likeness d) Dynamics simulation

26. Which of the following terminology refers to the molecular modelling computational method that uses quantum physics?

a) Quantum mechanics b) Molecular mechanics

c) Quantum theory d) Molecular modelling

27. BLOSUM matrices are used for

a) phylogenetic analysis b) pair-wise sequence alignment

c) multiple sequence alignment d) None of these

28. In finding the distant evolutionary relationships, threading and fold recognition concept detect structural homologs _____ relying on sequence similarities and they have been shown to be _____ when compared with PSI-BLAST

a) without completely, far more sensitive b) completely, far more sensitive

c) completely, less sensitive d) without completely, less sensitive

29. The unique properties of each amino acid are determined by its particular

a) hydrogen bond b) amino group c) peptide bond d) R group

30. In structure prediction, the fragments with assigned _____ structures are subsequently assembled into a _____ dimensional configuration in Rosetta.

a) primary, three b) secondary, three c) secondary, two d) primary, three

Part-B **(10 x 2=20)**

Answer any ten questions

31. Define Bioinformatics.
32. List any four UNIX/LINUX navigation commands.
33. Give a note on PDB database.
34. Define global and local alignments.
35. Define contig assembly.
36. What is multiple sequence alignment?
37. Write a note on SEQUIN.
38. Summarize the role of solvent accessibility in protein structure conformation?
39. Give the importance of backbone construction in modelling protein.
40. What are consensus secondary structure and its importance?
41. Explain SCOP and CATH.
42. Write a brief note on PubMed database.

Part – C **(5 x5=25)**

Answer any five questions

43. Explain in detail about the six frame translation and its uses.

44. Write a detailed note on gene prediction methods and tools.
45. Explain briefly the BLAST algorithm, tool with its versions and applications.
46. Explain the tree representation, methods for constructing phylogenetic tree and its application in evolutionary analysis.
47. Define force field and explain its importance in protein 3-D structure modeling.
48. Write in detail about the steps involved in homology modeling.
49. Discuss the Fold recognition and threading methods in detail.
50. Explain the basic concept of virtual screening and docking along with a list of software tools.

R5707

Sub. Code 501204

M.Sc. DEGREE EXAMINATION, APRIL - 2021

Biotechnology

Second Semester

GENOMICS AND PROTEOMICS

(CBCS – 2020 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A **(30 × 1 = 30)**

Answer all questions.

All questions carry equal marks.

1. A genetic element that is unessential to the host and can replicate either autonomously or be integrated into the chromosome of the host bacterium is

   a) plasmid b) episome

   c) extrachromosomal DNA d) genome

2. The 2-nm DNA molecule is first condensed into

   a) 11-nm nucleosomes b) 30-nm chromatin fibers

   c) supercoiled domains d) chromosome scaffolds

3. The bacterial plasmids carry _____ genes to promote bacterial conjugation

   a) *tra* b) *amp*

   c) *ccd*B d) *lacZ*

4. Which of the following does a mitochondrial DNA not encode for?

   a) rRNA b) tRNA

   c) snRNA d) proteins

5. A general feature of ctDNA is a 10–24 kb sequence present in ____ identical copies as an inverted repeat

   a) two b) three

   c) four d) five

6.Short tandem repeats (STRs) are polymorphic sequences of _____ pairs long

   a) 100-200 nt b)10-50 nt

   c) 10-20 nt d) 2-5 nt

7. Physical maps are generated using

a) plasmids b) contigs

c) hybridization d) reporter genes

8. Unit of distance in genetic maps is

a) centiMeter b) base pair

c) centiMorgans d) hotspots

9. 5′-GAATTC-3′ is the recognition site for enzyme

a) *Eco*RV b) *Hin*dIII

c) *Eco*RI d) *Bam*HI

10. A single, short oligonucleotide primer (8-12 nts) binds to many different loci amplifying random sequences from a complex DNA template is the principle of

a) RAPD b) RFLP

c) AFLP d) SSCP

11. In RH mapping, 1% frequency of breakageis expressed as

a) 1 Kb b) 1 centiMeter

c) 1 centiMorgan d) 1 centiRay

12. The stain which is used in Q-banding of chromosomes is

a) Giemsa b) quinolone

c) quinine d) quinacrine

13. _____ aims to identify all nongenic functional elements in the human genome

a) BLAST b) ENCODE

c) iBOL d) NCBI

14. Dideoxynucleotide triphosphates (ddNTPs) stop DNA synthesis due to the presence of

a) 3′-OH group b) 5′-PO_4 group

c) 3′-H group d) 3′-PO_4 group

15. Hierarchical shotgun sequencing involve preparation of

a) SNPs b) BAC library

c) exon d) exome

16. Homologous genes within an organism that encode proteins with related but non-identical functions are

a) paralogs b) orthologs

c) introns d) cis-regulatory elements

17. _____ are regulatory elements that up regulate gene expression by sequence-specific positioning of transcriptional activators

a) Enhancers b) Silencers

c) Insulators d) Matrix attachment regions

18. Which of the following is a type II DNA topoisomerase?

a) Helicase b) Polymerase

c) Gyrase d) Recombinase

19. Which of the following statements regarding 16S rRNA gene sequence is correct?

a)It does not show relationship between organisms

b)It shows transcriptome profile of an organism

c) It shows evolutionary distance between organisms

d) It cannot identify all bacteria from phyla level to species level

20. The mutation which introduces premature stop codon is termed as

a) missense b) nonsense

c) synonymous d) frameshift

21.The entire complement of proteins synthesized by a cell or organism is termed

a) genome b) transcriptome

c) translatome d) proteome

22. In a 2D-PAGE, the second dimension separates proteins based on the

a) molecular mass b) net negative charge

c) net positive charge d) amino terminal ends

23. Which of the following is a component of Mass Spectrometer?

a) Nitrocellulose membrane b) Ion detector

c) Incubation chamber d) Sweep generator

24. MALDI stands for

a) Matrix Assisted Linear Desorption Ionization

b) Mass Assisted Linear Desorption Ionization

c) Matrix Assisted Laser Desorption Ionization

d) MassAssisted Laser Desorption Ionization

25. The "bait" protein is fused to _____ of a transcription factor

a) DNA-binding domain b) transcription activation domain

c) signal-sensing domain d) phosphorylation motif

26. Which of the following statements is incorrect?

a) SAGE is used in identifying the transcriptome

b) CAGE is used in determining the transcriptome

c) PAGE is used in determining the transcriptome

d) MPSS is used in identifying the transcriptome

27._____ is a method of analyzing long stretches of DNA by small overlapping fragments from the reconstructed genomic library

a) chromosome walking b) AFLP

c) RFLP d) chromosome painting

28. *Fok*I domain in Zinc Finger Nucleases

a) methylates dsDNA b) cuts ssRNA

c) methylates ssRNA d) cuts dsDNA

29. 3,3′,5,5′-Tetramethylbenzidine is a substrate for the enzyme

a) H_2O_2 b) catalase

c) laccase d) horseradish peroxidase

30. _____ is a biological database and source of known and predicted protein-protein interactions

a) DDBJ b) STRING

c) GenBank d) RCSB

Part B **(10 x 2 = 20)**

Answer any ten questions

All questions carry equal marks

31. How do histones help in chromatin organization?

32. Differentiate mitochondrial and chloroplast DNA.

33. What is RFLP? Give any two of its applications in genetic mapping.

34. Define radiation hybrids.

35. Write a short note on human autosomes and allosomes.

36. List any four features of Bacterial Artificial Chromosomes (BACs).

37. Highlight the significance of 16S rRNA sequencing in bacterial identification.

38. Brief the importance of comparative genomics in drug discovery.

39. State the principle of MALDI-TOF.

40. Give two applications of yeast two-hybrid system.

41. Illustrate reverse genetics.

42. What is lipidome? How lipidome analysis is carried out?

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Part C **(5 x 5 = 25)**

Answer any five questions

All questions carry equal marks

43. How pBR322 plasmid was constructed? Illustrate the steps with a neat diagram.

44. Elaborate the steps involved in physical mapping.

45. Briefly explain FISH technique and mention its applications in genomics.

46. Detail the process of whole genome shotgun sequencing.

47. Give the background of horizontal gene transfer (HGT) with an example.

48. Two-dimensional PAGE is applied for separation of complex protein mixtures. Detail the principle and steps followed.

49. How gene(s) can be identified through transcriptome analysis?

50. Discuss and differentiate the types of protein microarrays.

R5708

Sub. Code 501205

M.Sc. DEGREE EXAMINATION, APRIL - 2021
Biotechnology

Second Semester

MOLECULAR DIAGNOSTICS

(CBCS – 2020 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A **(30× 1 = 30)**

Answer all questions.

All questions carry equal marks.

1. The adjacent nucleotide subunits of DNA are joined by

   a) disulfide bonds b) hydrogen bonds

   c) sulfur bonds d) phosphodiester bonds

2. The code for amino acid lysine is

   a) K b) L

   c) Y d) N

3. Using energy from ATP, DNA gyrase introduces

   a) thymidine dimers b) RNA primers

   c) negative supercoils d) positive supercoils

4. Cohesin promotes

   a) binding between sister chromatids b) separation of sister chromatids

   c) binding between anaphase chromosomes d) replication of chromosomes

5. The first phase of drug metabolism is

   a) conjugation b) oxidation/reduction

   c) deproteination d) excretion

6. SYBR Green binds to _____ of double stranded DNA

   a) major groove b) minor groove

   c) 3′-OH end d) 5′-PO_4 end

7. ARMS-PCR is used to detect

a) SNPs b) STRs

c) VNTRs d) SSRs

8. For indirect labeling of FISH probes, the modified nucleotides will contain a

a) Fab fragment b) adjuvant

c) immunogen d) hapten

9. The basic principle of immunosorbent assays is

a) antigen-antibody complex formation b) DNA-protein interaction

c) immunoglobulin-fluorophore interaction d) substrate modification reaction

10. The RFLPs are highly locus-specific and most of them are _____ markers

a) recessive b) autosomal recessive

c) codominant d) dominant

11. The DNA molecule with _____ takes more time to melt.

a) lower GC content b) mutated AT

c) higher GC content d) no GC content

12. In emulsion PCR, one primer is attached to the surface of a

a) bead b) amino acid

c) polymerase d) polypropylene tube

13. Which of the following is not a method of fabrication of DNA microarrays?

a) Photolithography b) Dot blotting

c) Ink-jet printing d) Robotic spotting

14. _____ is used to analyze large number of transcripts in any cells or tissues

a) PAGE b) SNP

c) SAGE d) SSCE

15. The rRNA which is located in the small subunit of prokaryotic ribosome is

a) 5S b) 16S

c) 23S d) 50S

16. Mass spectrometry detects metabolites on the basis of _____ ratio

a) charge / mass
b) mass / charge
c) volume / retention time
d) retention time / volume

17. Upon acute and chronic inflammation, immune cells secrete

a) chaperones
b) interferon
c) proinsulin
d) interleukin

18. In homocystinuria the metabolism of amino acid _____ is affected

a) methionine
b) lysine
c) arginine
d) phenylalanine

19. The principle of NMR relies on

a) valent ions
b) charge of the nucleus
c) nuclear spin
d) charge of the molecule

20. Which of the following is not a beta-lactam antibiotic?

a) penicillin
b) ampicillin
c) amoxicillin
d) kanamycin

21. The technique(s) which eliminate the need for selective media to detect pathogenic microbes is/are

a) in vitro culturing
b) PCR
c) colony counting
d) all the above

22. In the 5'-UTR, a healthy individual has only 30 repeats, whereas in fragile X syndrome patients, hundreds or thousands of repeats of trinucleotides will be found. The trinucleotide sequence is ___

a) ATG
b) CGG
c) CTG
d) GGT

23. The molecular mechanisms of repeat expansion in FMR-1 gene associated FRAXA are

a) increased CpG methylation, decreased mRNA and protein levels
b) decreased CpG methylation, increased mRNA and protein levels
c) increased protein levels, decreased CpG methylation and mRNA levels
d) decreased protein levels, increased CpG methylation and mRNA levels

24. *VHL* (von Hippel–Lindau)gene is methylated in

a) leukemia b)breast cancer

c) renal cancer d) colon cancer

25. Sequence analysis of the VHL coding region, intron 1, and flanking sequences will identify mutation(s) such as

a) deletion and insertion b) missense

c) splice site variants d) all the above

26. In which part of the large bowel do most colorectal cancers occur?

a) Ascending colon and rectum b) Transverse colon and rectum

c) Descending colon and rectum d) Sigmoid colon and rectum

27. Oncogenes are the cancer-causing genes that do not express usually. This is due to the presence of

a) Proto oncogenes b) tumor promoters

c) tumor suppressor genes d) transposons or jumping genes

28. The cytochemical stain which helps to differentiate leukemoid reaction from chronic myeloid leukemia is

a) Leukocyte alakaline phosphatase b) Sudan black

c) Perioidic acid schiff d) Nonspecific esterase

29. An internal radiation therapy in which radioactive material is implanted near the tumor site is known as

a) Local radiation b) Brachytherapy

c) Implant radiation d) Vicinity radiation therapy

30. The site of the gene, at which the mutations occur at high frequency are

a) recons b) hotspots

c) mutons d) palindromes

Part - B **(10 x 2 = 20)**

Answer any ten questions

All questions carry equal marks

31. Compare the forms of B-DNA and Z-DNA.

32. Define DNA polymorphism. Illustrate with an example.

33. State the principle behind denaturing gradient gel electrophoresis (DGGE).

34. Mention four applications of 16S rRNA typing.

35. How will you analyze the metabolite profile of an individual using NMR technology?

36. List few biomarkers and the metabolic disorders.

37. What is antibiotic resistance? Give an example.

38. How are trinucleotide repeat diseases caused? Give an example.

39. Discuss and differentiate the fragile X syndromes FRAXA and FRAXE.

40. Give the genetic background of chronic myeloid leukemia.

41. What is personalized medicine? Give an example.

42. Define quality control.

Part - C **(5 x 5 = 25)**

Answer any five questions

All questions carry equal marks

43. Detail the structure and composition of chromosome.

44. What are the clinical applications of real-time PCR and multiplex PCR?

45. Illustrate the following methods:

    i) RFLP ii) SSCP

46. Explain the principle, working and applications of LCMS in detecting various metabolic disorders.

47. How does PCR help in identification of pathogenic microorganisms that are difficult to cultivate *in vitro*?

48. Elaborate the background, inheritance and diagnosis of von Hippel-Lindau disease.

49. Discuss the role of predictive biomarkers in:

    i) lung cancer ii) melanoma

50. Discuss the genetic background, diagnosis and treatment/therapy of breast cancer.

R5709

Sub. Code 501206

M.Sc., DEGREE EXAMINATION, APRIL - 2021

Biotechnology

Second Semester

RESEARCH METHODOLOGY AND SCIENTIFIC COMMUNICATION SKILLS

(CBCS-2020 onwards)

Time: 3 Hours Maximum: 75 Marks

Part - A **(30 x 1 = 30)**

Answer all questions.

1. The data collected from the experimental evidences are categorized as

   (a) preliminary data (c) empirical data

   (b) experimental data (d) none of the above

2. Case study is a type of

   (a) qualitative (c) survey

   (b) quantitative (d) none of the above

3. What characteristics in qualitative research are considered critical?

   (a) data collection using standard research tools.

   (b) data collection with scientific proof from evidence

   (c) design sampling with probability sample techniques.

   (d) gathering the research with the bottom up.

4. The scientific method involves

   (a) Formulation of hypothesis (c) all the above

   (b) Testing of hypothesis (d) analysis of data and drawing conclusions

5. What is it called when journals go through an extra step of having experts in the field review the validity of the information before it is published?

   (a) journal review (c) peer review

   (b) information review (d) article review

6. Preliminary data collection is a part of the……..

   (a) Descriptive research (c) Exploratory research

   (b) Applied research (d) Explanatory research

7. What is a bibliography?

(a) a list of the books referred to in a scholarly work
(c) Report Writing
(b) a list of scholars in the lab
(d) None of these

8. What is the name of the conceptual framework in which the research is carried out?

(a) Research hypothesis
(c) Research problem
(b) Research design
(d) Report

9. An effective title of the research article should be

(a) concise and attractive

(b) able to introduce the research work to the fullest

(c) convey the main topic of the study

(d) all of above.

10. A review of literature should be carried out

(a) Before preparation of a research proposal
(c) After completion of research work
(b) While preparing manuscript/thesis
(d) while writing discussion part of the research work

11. Which of the following research type focuses on ameliorating the prevailing situations?

(a) Fundamental research
(c) Applied research
(b) Action research
(d) Experimental research

12. The issue of research ethics may be considered pertinent at which stage of research?

(a) At the stage of problem formulation and its definition

(b) At the stage of data collection

(c) At the stage of defining the research population

(d) At the stage of reporting the finding and interpretation .

13. The format of thesis writing is same as

(a) Preparation of research article/paper
(c) writing a seminar presentation
(b) A research dissertation
(d) presenting a conference paper

14. What is the main objective of research?

(a) To review the literature

(b) To get an academic degree

(c) To summarize what is known

(d) To discover new facts or to make interpretations of known facts

15. Which of the following is an indication of the quality of a research journal?

(a) Impact Factor (c) h-index

(b) G-index (d) i-10 index

16. EULA stands for

(a) End user license agreement (c) End user logistics agreement

(b) Electronic usage of license acquisitions (d) End user logistics association

17. Which search engine is commonly used to find, locate and retrieve OER ?

(a) Bingo (c) Yahoo

(b) Google (d) none of these

18. Which is the feature of a research proposal?

(a) A short literature review (c) A section of objectives

(b) proposed data collection methods (d) all of the above

19. Which is not a level of qualitative analysis?

(a) DNA sequencing (c) Comparison of DNA sequencing

(b) Site directed mutagenesis (d) none

20. The main purpose of a "References" section in a scientific paper:

(a) Is to acknowledge your colleagues who gave you advice.

(b) Is to present other papers that the reader might want to consult.

(c) Is to provide a list of scientists who have repeated your research.

(d) Is to acknowledge research and concepts upon which your work builds.

21. Which one of the following can come under does the longitudinal research approach actually deal with?

(a) Long term research (c) Horizontal research

(b) Short term research (d) None of the above

22. A good criteria's of any research design……..

(a) Capacity to answer a problem (c) current methodology

(b) Control of Variables (d) all of the above

23. In what type of research does researcher explore an individual subject in depth?

(a) Naturalistic Observation (c) Laboratory Observation

(b) Case study (d) Survey study

24. Which of the following are associated with behavioral observation?

(a) Non-Verbal Analysis (c) Linguistics Analysis

(b) Spatial Analysis (d) all the above

25. What is the purpose of doing research?

(a) To identify a problem (c) To find a solution

(b) Both (a) and (c) (d) none of these

26. In group interview there are……..

(a) One Interviewer & One Interviewee

(b) More than One Interviewer & One Interviewee

(c) One Interviewer & More than One Interviewee

(d) More than One Interviewer & More than One Interviewee

27. Computer operations are through

(a) Binary digits (c) Fraction

(b) Reminder (d) Decimal

28. Which one of the following is a common diagnostic study?

(a) 2D Gel Electrophoresis (c) ELISA

(b) Metagenomics (d) None

29. A short summary of Technical Report is called

(a) Article (c) Review

(b) Research abstract (d) Discussion

30. In a research report ……is used to explain experimental protocols

(a) Bibliography (c) Material & methods

(b) Result (d) Introduction

Part B **(10 x 2 = 20)**

Answer any ten questions.

31. List the differences between Quantitative vs. Qualitative data.

32. What you mean by literature survey?

33. Define random sampling

34. What are the qualities of a good mentor for research?

35. List the differences between Primary and Secondary data.

36. What is plagiarism? Mention any software to check plagiarism.

37. What is the search engine will be suitable to get the list of publication of a researcher? And explain how it works

38. Describe the procedures for maintaining a lab notebook.

39. What are effective communication skills?

40. Explain the various types of group discussion.

41. What is Blind review process?

42. Explain the differences between formal and informal presentation styles.

Part C **(5 x 5 = 25)**

Answer any five questions.

43. What is the difference between reductionist and holistic approach?

44. What do you mean by research? Brief the different steps involved in a research process.

45. Explain the meaning and significance of a research design.

46. Describe the different methods for data collection.

47. How to write a scientific report?

48. Explain how to give an oral presentation of research findings and why it's essential.

49. What is the communication barrier? Explain the types of communication barrier

50. What are the ethics in scientific research?

_____

R5710

Sub. Code 501207

M.Sc. DEGREE EXAMINATION, APRIL - 2021
Biotechnology

Second Semester

LAB-IV: MOLECULAR BIOLOGY AND GENETIC ENGINEERING

(CBCS – 2020 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (30× 1 = 30)

Answer all questions.

All questions carry equal marks.

1. When a medium contains lactose and glucose, the order of utilization of carbon source is

   a) glucose, glucose, galactose
   b) glucose, galactose, glucose
   c) lactose, glucose
   d) galactose, galactose, lactose

2. A messenger RNA that encodes more than one protein is termed as

   a) monocistronic mRNA
   b) small nuclear RNA
   c) polycistronic mRNA
   d) microRNA

3. Insertion or deletion in a DNA sequence that alters the way the sequence is read is known as

   a) point mutation
   b) transverse mutation
   c) translocation mutation
   d) frameshift mutation

4. The mutants which lose ability to synthesize an essential metabolite under UV treatment and require external supplementation for growth are

   a) chemotrophs
   b) autotrophs
   c) prototrophs
   d) auxotrophs

5. M13 Phage precipitation is done using

   a) mercuric chloride
   b) polyethylene glycol
   c) sodium nitrate
   d) caesium chloride

6. A bacteriophage that can follow both lytic and lysogenic cycles is termed as

   a) temperate phage
   b) virulent phage
   c) prophage
   d) none of these

7. The characteristic of an F^+ bacterial cell is

a) pili
b) cilia
c) flagella
d) chromosome

8. What does Hfr in conjugation stand for?

a) High frequency rate
b) High frequency radiowave
c) High frequency recombination
d) High fatality rate

9. _____ disrupts H-bonding between bases converting the double-stranded DNA (dsDNA) to single-stranded DNA (ssDNA)

a) SDS
b) NaOH
c) EDTA
d) C_2H_5OH

10. The absorbance ratio(s) used to assess the purity of DNA is/are

a) 260/280
b) 260/230
c) 260/300
d) both (a) and (b)

11. The gene *PvuII* is named after

a) *Pseudomonas vulgatus*
b) *Proteus vulgaris*
c) *Bacteroides vulgatus*
d) *Proteus mirabilis*

12. In case of unique recognition sites in a linear DNA, double digestion produces _____ fragments

a) 2
b) 3
c) 4
d) 5

13. Ethidium bromide is a/an

a) fluorescent dye
b) intercalating agent
c) mutagen
d) all the above

14. In agarose gel electrophoresis, increase in the voltage

a) increases the migration rate
b) decreases the migration rate
c) increases the band size
d) decreases the band size

15. Initial denaturation is carried out at

a) 55°C
b) 75°C
c) 95°C
d) 105°C

16. Thermostabe DNA polymerase I used to withstand high temperatures of PCR is isolated from

a) *Thermus aquaticus* b) *Escherichia coli*

c) *Pseudomonas fluorescens* d) *Pseudomonasaeruginosa*

17. Which of the following endonucleases recognizes and methylates a single sequence but cleaves DNA up to 1000 bp away?

a) Type I b) Type II

c) Type III d) Type IIS

18. The enzyme which catalyzes the addition of a series of nucleotides to the 3′ end of a DNA fragment is

a) Alkaline phosphatase b) Terminal deoxynucleotidyl transferase

c) Polynucleotide kinases d) Acid pyrophosphatase

19. E. coli is incubated and grown at ____ before treating with calcium chloride in competent cell preparation.

a) 28°C b) 32°C

c) 37°C d) 42°C

20. Which of the following agents is/are used to make bacterial cells competent?

a) fluoroquinolone b) UV light

c) calcium chloride d) all the above

21. The transformation efficiency using the calcium chloride method

a) increases with increasing plasmid size

b) remains same for all plasmids

c) decreases with increasing plasmid size

d) remains low for all plasmids

22. X-gal is cleaved by

a) α-glucosidase b) β-galactosidase

c) lactase d) transacetylase

23. Transformants can be identified by

a) colony PCR b) AMES test

c) Western blot d) SDS-PAGE

24. Bacterial cells guard their own DNA from degradation by the restriction endonucleases by

a) removing all recognition sites from the genome

b) methylating DNA at recognition sites

c) not producing any restriction endonucleases

d) inactivating the restriction endonucleases

25. The initiation codon is

a) UAA b) UAG

c) UGA d) AUG

26. SDS is a/an

a) mutagen b) fixative

c) anionic detergent d) cationic detergent

27. Which of the following metal ions is not used in purification of his-tag?

a) Ni^{2+} b) Ra^{2+}

c) Co^{2+} d) Zn^{2+}

28. Klenow fragment

a) lacks 5′---->3′ exonuclease activity b) lacks 5′---->3′ polymerase activity

c) lacks 3′---->5′ exonuclease activity d) retains 5′---->3′exonuclease activity

29. Southern blot can be used to

a) denature proteins b) identify proteins

c) delete genes d) map genes

30. Radiolabeled probes may be detected using

a) TEM b) X-ray diffraction

c) autoradiography d) SEM

Part B **(10 x 2 = 20)**

Answer any ten questions

All questions carry equal marks

31. Define lac operon.

32. Define mutagen. Give few examples.

33. How genetic information is transferred through conjugation?

34. State the principle of spectrophotometer.
35. Mention two Type II restriction endonucleases and their recognition sequences.
36. Draw the structure of agarose.
37. Define melting temperature and how it is calculated?
38. Differentiate T4 DNA ligase and E. coli DNA ligase.
39. What is the role of $CaCl_2$ in competent cell preparation?
40. What is colony PCR?
41. Mention the size range of proteins (in kDa) separated in 10% and 15% SDS-PAGE gel?
42. List the applications of Southern hybridization.

Part C **(5 x 5 = 25)**

Answer any five questions

All questions carry equal marks

43. Detail the concept and functioning of lac operon.
44. Mention the role of reagents used in plasmid isolation.
45. State the principle and working of agarose gel electrophoresis.
46. Describe the processes taking place in polymerase chain reaction.
47. How will you transform a plasmid into *E. coli*?
48. How does restriction mapping help in identifying microorganisms?
49. Elucidate the steps involved in SDS-PAGE analysis. Illustrate.
50. Give a brief account on random primer labelling and its applications.

R5711	Sub. Code 501208

M.Sc. DEGREE EXAMINATION, APRIL - 2021

Biotechnology

Second Semester

LAB-V: IMMUNOLOGY

(CBCS – 2020 Onwards)

Time: 3 Hours Maximum: 75 Marks

Part – A **(30 x 1= 30)**

Answer ALL Questions

1) Write down the MWCO value of IgG and IgY?
   a) 150 & 180 b) 120 & 130 c) 110 & 170 d) 160 & 140

2) Write the parental cell for Monoclonal antibody production.
   a) Myeloma cells b) spleen cells c) plasma cells d) hybridoma cells

3) What is PMT in FACS?
   a) Pre medical test b) photomultiplier tube
   c) photoelectrical tube d) primary multiplier tube

4) What do 280 represent in A280 of Spectrometry?
   a) Wavelength b) frequency c) oxidation d) electromagnetic energy

5) What is the molecular nature of using Dextran which is used for neutrophil separation?
   a) Polysaccharide b) Disaccharide c) Enantiomer d) Isomer

6) Why is pulse vortex or minimum vortex recommended for Neutrophil isolation?
   a) Pulse vortex or minimum vortex causes enzymatic digestion of neutrophils
   b) Pulse vortex or minimum vortex increases adhesion in neutrophils
   c) Pulse vortex or minimum vortex prevents activationof neutrophils
   d) Pulse vortex or minimum vortex decreases granularity of neutrophils

7) Why is Ficoll light sensitive?
   a) Sodium diatrizoate is light-sensitive b) sodium benzoate is light-sensitive
   c) sodium malate is light-sensitive d) sodium pyruvate is light-sensitive

8) Which statement is wrong regarding TTBS?
   a) Can be used as wash buffer
   b) TWEEN20 in the TTBS removes fat from the membrane
   c) TTBS maintains the pH of 7.4
   d) TTBS shows interaction with immune reactions

9) Convert 10000 RCF to RPM where the radius of the rotor is 13 cm.
a) 8287 b)2621 c) 8254 d) 26207

10) The characteristic feature of Density Gradient separation in a centrifuge?
a) Separation of any particles with diameters less than about 20 µm
b) Based on a decreasing density of the suspending solution and migration of the targets
c) Have characteristic of buoyancy on continuous density gradients
d) All the above

11) Why should we use HBSS media without Calcium or Magnesium for neutrophil separation?
a) Ca/ Mg causes enzymatic digestion of neutrophils
b) Ca/ Mg increases adhesion in neutrophils
c) Ca/ Mg prime/activates neutrophils
d) Ca/ Mg decreases granularity of neutrophils

12) What is the pH for stacking and resolving gel in SDS-PAGE?
a) 5.8, 8.8 b) 7.8, 8.8 c)6.8, 8.8 d) 6.4,7.4

13) What is the role of beta-mercaptoethanol in SDS-PAGE?
a) Beta-mercaptoethanol imparts uniform negative charge and linearises your protein
b) Beta-mercaptoethanol breaks cysteine-cysteine disulphide bridges.
c) Beta-mercaptoethanol is an essential catalyst for polyacrylamide gel polymerization.
d) Beta-mercaptoethanol is an oxidizing agent that is often used with tetramethylethylenediamine

14) Write down the techniques to study the protein both qualitatively and quantitatively.
a) Nanodrop b)ELISA c) RT PCR d) Autradiography

15) Serum contains_____.
a) Platelets b) antibodies c) fibrinogen d) prothrombin

16) Write any 2 cryogenic gases.
a) liquid nitrogen and liquid oxygen b) liquid nitrogen and benzene
c) Carbon monoxide and oxygen d) liquid nitrogen and liquid helium

17) Which statement regarding cryoprotectant is wrong?
a) Cryoprotectant agents are used to prevent ice formation
b) Cryoprotectants causes freezing damage to the biological tissue when cooling the organs
c) Cryoprotectants are used to protect the cell membrane integrity and intracellular environment.
d) Some of the cryoprotective additives includes dimethylsulfoxide (Me2SO), glycerol, saccharose, glucose, methanol, polyvinyl pyrrolidone (PVP), sorbitol, and malt extract.

18) In Ouchterlony double diffusion method, a pattern of crossed lines/ intersect in the result demonstrates
a) Identity b) partial identity c) non identity d) common epitope

19) Which statement regarding applications of immuno- electrophoresis is not true?
a) Immunoelectrophoresis is used in patients with suspected monoclonal and polyclonal gammopathies.
b) The method is used to detect normal as well as abnormal proteins, such as myeloma proteins in human serum.
c) Used to analyze complex protein mixtures containing different antigens.
d) This method is not useful to monitor antigen and antigen-antibody purity and to identify a single antigen in a mixture of antigens.

20) Giemsa stain is a type of _____stain.
a) simple b) special c) differential d) acidic

21) What is Hemolysis?
a) Hemolysis is the disruption of erythrocyte membranes, which causes the release of platelets
b) Hemolysis is the disruption of erythrocyte membranes, which causes the release of serum
c) Hemolysis is the disruption of erythrocyte membranes, which causes the release of plasma
d) Hemolysis is the disruption of erythrocyte membranes, which causes the release of hemoglobin

22) Write the methods of ELISA for antibody detection.
a) Antibody coated fluorescent b) Antigen coated enzyme
c) Antibody coated enzyme d) Antibody coated fluorescent

23) What is Sensitization?
a) Vaccination b) innate response
c) cell mediated immune response d) none of the above

24) Latex bead is made up of _____.
a) Plastic b) Polytene c) Polystyrene d) Rubber

25) Write the types of granulocytes.
a) B cells, T cells and Macrophage b) B cells, T cells and Mast cells
c) Basophil, mast cells and neutrophil d) Basophil, macrophage and neutrophil

26) Write the ELISA method commonly used for antigen detection.
a) Antibody coated surface b) Cells coated surface
c) Fluorescent coated surface d) Enzyme coated surface

27) What is IPTG?
a) Allosteric Inducer b) Repressor c) Enhancer d) Allosteric repressor

28) Radial immuno diffusion measures
a) Quantitative estimation of antigen b) Quantitative estimation of antibody
c) Qualitative estimation of antibody d) Qualitative estimation of antigen

29) Which stains used for peripheral blood smear identification?
a) Romanowsky stains b) Wright's stain c) Giemsa stain d) All of the above

30) What is agglutination?
a) Protein-protein interaction b) Protein-RBC interaction
c) Protein-WBC interaction d) All of the above

Part - B **(10 x 2= 20)**

Answer any TEN Questions

31) Mention the graphical localization of granulated neutrophils in dot plot while separating from whole serum sample.
32) Define the role of sodium metrizoate in LSM buffer?
33) What is Beer-Lambert law?
34) Describe about Ponceau S stain.
35) What are spot forming units?
36) How do you make Ficoll gradient?
37) Write the differences of plasma and serum.
38) What is immunization?
39) What is ELISA?
40) Write any 4 substrates used in ELISA method.
41) Write the principle of Radial immune diffusion.
42) Define diffusion.

Part - C **(5 x 5 = 25)**

Answer any FIVE Questions

43) Write in detail about protein separation through SDS-PAGE.
44) How can we sort the cells during their mitotic events using FACS? Describe in detail.
45) How can we separate leucocyte through density gradient method using Dextran?
46) Describe in detail about ELISPOT.
47) Write the principle and applications of ELISA
48) Write the principle and applications of complement fixation test.
49) Elaborate the methods of blood collection and serum separation from animals.
50) Discuss about the antibody titre by ELISA method.

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R5712

Sub. Code 501501

M.Sc. DEGREE EXAMINATION, APRIL - 2021
Biotechnology

Second Semester

ENVIRONMENTAL BIOTECHNOLOGY
(CBCS - 2020 onwards)

Time: 3 Hours **Maximum: 75 Marks**

Part A **(30 x 1 = 30)**

Answer all questions

1. Application of living microorganism to degrade environmental pollutants is called
   a) Microremediation b) Nanoremediation
   c) Bioremediation d) All of the above
2. The process of extracting metals from ore bearing rocks is called
   a) Detoxification b) Biostimulation
   c) Biofiltration d) Bioleaching
3. Ex situ remediation involves
   a) Degradation of pollutants by microbes directly
   b) Removal of pollutants and collection at a place to facilitate microbial degradation
   c) Degradation of pollutants by GMOs
   d) None of the above
4. *Chlorella* sp are widely used in the removal of
   a) Organic wastes b) Hydrocarbons
   c) Heavy metals d) All of the above
5. An indirect interaction of heavy metals by microbial surface is called
   a) Biotransformation
   b) Bioconversion
   c) Biosorption
   d) Biomining
6. Which of the following factors is not responsible for decline or loss of species?
   a) Land conversion
   b) Unsustainable harvesting of natural resources
   c) Introduction of exotic species
   d) Afforestation
7. One of the following is not a process of remediation?
   a) Vitrification
   b) Thermal degradation
   c) Bio-leaching
   d) Chemical degradation
8. Which one of the following is a drawback of biological method of soil remediation?
   a) Contaminants may not be conducive
   b) Residual effects of human activities

c) Biological contaminants
d) Non-Biological contaminants

9. The harmful toxic compound that is present in cosmetics is _____
   a) Aluminium
   b) Parabens
   c) Oxygen
   d) Nitrogen
10. The harmful toxic compounds from the environment gets deposited in an organism within _____
   a) Trophic level
   b) Parabens
   c) Oxygen
   d) Nitrogen
11. Secondary treatment systems can be used for biological degradation of _____ in municipal waste waters.
   a) Carbon dioxide and methane
   b) Nitrogen and CO_2
   c) CO and methane
   d) Organic pollutants
12. The major disadvantage of heterotrophic nitrification is _____ for final disposal.
   a) Excess sludge generation
   b) Less sludge generation
   c) Presence of oxygen
   d) Presence of carbon source
13. The hollow rhizomes of the reeds generate a hydraulic pathway thereby treating sewage by _____
   a) Flocculation
   b) Bacterial activity
   c) Precipitation
   d) Sedimentation
14. Which of the following factors can determine the rate of degradability of cells?
   a) Residence time
   b) Fermentation time
   c) Instability
   d) Growth
15. How does microbial arbitrated removal of alkyl group from nitrogen atom takes place?
   a) Hydroxy-methyl intermediates
   b) Intercellular ligands
   c) Extracellular ligands
   d) Integral proteins
16. Which of the following is an end product of anaerobic composting in context to epoxidation?
   a) Amino acid
   b) Alcohol
   c) Toxic products
   d) Biogas

17. Which of the following processes uses hydroponics to remove water contaminants?
    a) Rhizofiltration
    b) Pollution control
    c) Antibiotic development
    d) Manufacturing process
18. Which of the following is the most common bacteria used for bioleaching?
    a) *Spirillum*
    b) *Coccus*
    c) *Bacillus*
    d) *Streptococcus*
19. *Acidithiobacillus* sp. is used to extract what kind of metal ore?
    a) Oxide
    b) Carbonate
    c) Silicate
    d) Sulphate
20. Which of these is not a strategy for the application of biosurfactants in oil recovery?
    a) Injection of biosurfactants into reservoir through well that produce microorganisms and multiply their growth in-situ
    b) Production of biosurfactants ex-situ while the same is injected into the reservoir
    c) Injecting selected nutrients into the reservoir
    d) Injecting microorganisms along with nutrients producing biomass
21. _____ is the transformation of a substance without any nutritional benefit.

    a) Cometabolism
    b) Metabolism
    c) Glycogenesis
    d) Gluconeogenesis

22. What is the major advantage of three-tire vermi-culture technology?
    a) It can be applied to both solid and liquid wastes
    b) It cannot be applied to both solid and liquid wastes
    c) It involves chemical treatment
    d) It can degrade organic wastes
23. Some strains of _____ bacteria can produce hydrogen, methane, acetate etc. by _____ of carbohydrates during initial growth phase.
    a) Obligate anaerobic; oxidation
    b) Facultative aerobic; reduction
    c) Obligate anaerobic; fermentation
    d) Facultative anaerobic; oxidation
24. Which of the following property is shown by the exo-enzyme with bio polymers?
    a) Adsorption
    b) Absorption
    c) Miscibility
    d) Immiscibility
25. Which of the following is a result of oxidation of unsaturated carbon double bonds?
    a) Aerobic composting

b) Anaerobic composting
c) Epoxide
d) Anaerobic digestion

26. Which of the following groups can be de-alkylated by microorganisms?
    a) N-linked alkylated groups
    b) C-linked alkylated groups
    c) F-linked alkylated groups
    d) G-linked alkylated groups
27. Which of the following process is observed when microalgae growing on a particular substrate can oxidize a second substrate?
    a) Co substrate
    b) Sugar substrate
    c) Potassium substrate
    d) Calcium substrate
28. Which of the following organisms represent the natural living style as biofilms?
    a) Microbial communities
    b) Fungi
    c) Protozoa
    d) Animals
29. Solidification is based on _____
    a) CO_2 release
    b) Time consumption
    c) Consume lots of energy
    d) Encapsulation
30. Which of the following terms is not relevant to distressing microbial population?
    a) Decrease in richness
    b) Variety of classes
    c) Resistant population
    d) Color of species

Part B **(10 x 2 =20)**

Answer any TEN questions

31. Write a note is meant endangered species?
32. List out any two electron donors involved in microbial metabolism
33. Define bioaugmentation
34. List any two factors leads to recalcitrance of an organic molecule discharged to soil
35. How phytovolatilization of pollutants occurs?
36. Write down the cell wall components of fungi
37. What are diazotrophs? Name some of them
38. Write down the general features of Baculovirus
39. How do advanced biofuels differ from corn ethanol?
40. What are bioplastics made of?
41. List out the surfactants that are being used now a days in enhanced oil recovery?
42. What is the role of xylanase in paper production?

Part - C **(5 x 5 = 25)**

Answer any five questions

43. Describe the role of microbes in nitrogen fixation
44. Give an account of the actions be carried out to preserve biodiversity and its hotspots?
45. Discuss on the advantages and disadvantages of bioremediation
46. Explain the role of white rot fungi in degrading organic pollutants
47. Mention the different mechanism involved in the removal of metals by microbes
48. Elaborate on the salient features of bacterial siderophore
49. Give an account of the different categories of bioinsecticides
50. Mention the conditions during which biosurfactants are produced and list out their applications

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