R6704

Sub. Code
501201

M.Sc. DEGREE EXAMINATION, APRIL – 2022

Second Semester

Biotechnology

GENETIC ENGINEERING

(CBCS – 2020 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (30 × 1 = 30)

(MCQ or Fill in the Blank Type Questions)

Answer **all** questions.

1. The enzyme takes part in the decatenation of DNA molecules is

   (a) Helicase

   (b) Topoisomerase

   (c) Ligase

   (d) Polymerase

2. According to Semiconservative model newly formed DNA contains _____

   (a) both new strands

   (b) both old strands

   (c) one new and one old strand

   (d) only one strand

3. Using _____selective degradation of single stranded DNA can be achieved

(a) nuclease

(b) S1nuclease

(c) protease

(d) doxy ribonuclease

4. First genetically modified crop to be approved in India is _____

(a) cotton

(b) brinjal

(c) tamarind

(d) mustard

5. Bt toxin is

(a) cry protein

(b) chlorophyll

(c) starch

(d) pieces of DNA

6. The gent of insulin was first cloned in which bacteria?

(a) *Shigella sp*

(b) *Salmonella typhi*

(c) *E. coli*

(d) *Clostridium tetani*

7. Who is known as the father of modern genetics?

(a) C V Raman

(b) George Kurian

(c) Mendel

(d) Morgan

8. The technique used in DNA fingerprinting is _____

(a) Southern blotting

(b) Western blotting

(c) Northern blotting

(d) None

9. What enzyme is used in CRISPR gene editing?

(a) Cas9

(b) EcoRI

(c) Ras

(d) GTPase

10. The vector used for Sangar sequencing is _____

(a) plasmid

(b) YAC

(c) CMV

(d) M13

11. Ti plasmid is from _____

(a) *Agrobacterium rhizogenes*

(b) *Agrobacterium tumefaciens*

(c) *Agrobacterium radiobacter*

(d) *Thermus aquaticus*

12. The tendency of an offspring to resemble its parent is known as

(a) Variation

(b) Heredity

(c) Resemblance

(d) Inheritance

13. Which of the following restriction enzymes/endonuclease is most widely used in genetic engineering?

(a) RE type I (b) RE type II

(c) RE type III (d) Both (a) and (b)

14. A short molecule containing 2-20 nucleotide is _____

(a) mononucleotide

(b) ribonucleotide

(c) oligonucleotide

(d) hexanucleotide

15. Electroporation is a technique _____

(a) the process of separating charged molecules through a gel maintained in an electric field

(b) the process of combining foreign DNA to an electrically charged vector molecule

(c) the application of high voltage pulses

(d) which sends foreign DNA into cells using microprojectiles

16. The DNA fingerprinting was developed by _____

(a) Francis Crick

(b) Khorana

(c) Alec Jeffrey

(d) James Watson

17. Enucleation of cells is caused by ————————

(a) polyethylene glycol

(b) cytochalasin B

(c) ethanol

(d) eosin

18. _____method of gene transfer mostly being used in plant science

(a) Liposome fusion

(b) Microinjection

(c) Electroporation

(d) Calcium chloride heat-shock transformation

19. Which of the following is used as a detecting tool in biological experiments?

(a) Luciferase (b) Helicase

(c) RNase (d) DNase

20. Origin of replication sequences are

(a) present in all chromosomes/plasmids

(b) important for protein synthesis

(c) important for RNA synthesis

(d) none

21. In general, a plasmid vector can be used to clone DNA insert of up to ————————.

(a) 1 kb

(b) 10 kb

(c) 15 kb

(d) 50 kb

22. A synthetic small RNAs are being used for gene silencing

(a) miRNA

(b) snoRNA

(c) siRNA

(d) ncRNA

23. A tube contains both DNA molecules of PCR amplified and the molecule isolated from the bacteria. Which of the following will you use to degrade the DNA isolated from the bacteria?

(a) Dpnl (b) NaOH

(c) EcoRI (d) HCl

24. Cosmid vectors are _____

(a) plasmids that contain fragment of λ DNA including the cos site

(b) phages that lack cos site

(c) plasmids that have no selection marker

(d) none of the above is correct

25. Telomeric sequences are found in ————————.

(a) Human artificial chromosome

(b) Bacterial artificial chromosome

(c) Yeast artificial chromosome

(d) (a) and (c)

26. The uptake of plasmid DNA into bacterial cell is facilitated by ————————.

(a) calcium chloride

(b) ethanol

(c) formaldehyde

(d) toluene

27. FlavrSaVr is ————————.

(a) transgenic tomato

(b) transgenic brinjal

(c) transgenic carrot

(d) transgenic capsicum

28. Which of the following is a plasmid?

(a) AIU I

(b) Hind III

(c) pBr 322

(d) Eco RI

29. For His-Tag purification, the column must contain _____.

(a) Ni^{++}

(b) Cu^{++}

(c) Fe^{++}

(d) K^{+}

30. Golden rice is a transgenic crop with improved _____.

(a) vitamin B content

(b) vitamin A content

(c) starch content

(d) curcumin content

Part B $(10 \times 2 = 20)$

Answer **any ten** questions.

31. What are non-radioactive probes?

32. What are linkers?

33. What are phagemids?

34. What are BACs?

35. What are mammalian expression vectors?

36. What is a Ti plasmid?

37. What is Taq polymerase?

38. What are oligo arrays?

39. What is chromatin immuno precipitation?

40. What are genomic libraries?

41. What is post transcriptional gene silencing?

42. What is GMO?

Part C ($5 \times 5 = 25$)

Answer any **five** questions.

43. Explain south-western hybridization.

44. Explain a method of labeling of DNA.

45. Explain artificial chromosome vectors.

46. Give an account on reverse-transcription PCR.

47. Write in detail about automated DNA sequencing.

48. Explain the steps involved in isolation of mRNA for sequencing purpose.

49. Write about the construction and analysis of microarray.

50. How will you silence a gene using RNAi?

R6705	Sub. Code 501202

M.Sc. DEGREE EXAMINATION, APRIL – 2022

Second Semester

Biotechnology

IMMUNOLOGY

(CBCS – 2020 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (30 × 1 = 30)

(MCQ or Fill in the Blank Type Questions)

Answer **all** questions.

1. The most effective immune cells/molecules identifying intracellular pathogens are

   (a) T helper cells

   (b) B cells

   (c) T cytotoxic cells

   (d) Complement

2. The following is not a characteristic feature of mast cell

   (a) Allergy

   (b) Associated with mucous layer

   (c) Having Ig E as a surface receptor

   (d) Peptide antibiotics

3. B-cell produces antibodies with varieties of variable region by

(a) different gene expression

(b) VDJ recombination

(c) cell differentiation

(d) none of the above

4. How many paratopes are present in Ig G and Ig A molecules?

(a) 2 and 4

(b) 4 and 2

(c) 4 and 10

(d) 10 and 4

5. 1gM consists of

(a) 10 light chains and 10 heavy chain

(b) 4 light chains and 4 heavy chain

(c) 2 light chains and 2 heavy chain

(d) 1 light chains and 1 heavy chain

6. Retrovirus infects

(a) T helper cell

(b) WBC

(c) B cells

(d) Mast cells

7. Antibodies are

(a) prostaglandins

(b) steroids

(c) lipoproteins

(d) glycoproteins

8. Transplanted graft may be rejected due to

(a) cell-mediated immune response

(b) humoral immune response

(c) innate immune response

(d) passive response

9. Which is working principle of ELISA?

(a) Ag-Ab neturalization

(b) Ag-Ab complex

(c) (a) and (b)

(d) None of the above

10. By Sandwich ELISA, which of the following is detected?

(a) Antigen

(b) Antibody

(c) (a) and (b)

(d) None of the above

11. Antibody found in secretions is?

(a) IgA

(b) IgG

(c) IgE

(d) IgM

12. Monoclonal antibodies are

(a) heterogenous antibodies produced from single clone of plasma cells

(b) homogenous antibodies produced from single clone of plasma cells

(c) both (a) and (b)

(d) none of these

13. Natural humoral immune response against a pathogen leads to the production of

(a) polyclonal antibodies

(b) monoclonal antibodies

(c) macrophages

(d) none of these

14. Antigen binding sites are present in

(a) Fab regions of an antibody

(b) Fc region of an antibody

(c) only in the light chain

(d) only in the heavy chain

15. Cytokines regulate the intensity and duration of the immune response by activating or down regulating both innate and adaptive immune response. The mode of action of the cytokine is the followings except:

(a) Autocrine

(b) Paracrine

(c) Endocrine

(d) Cell immortalization

16. The B cells are produced in

(a) Spleen

(b) Bone marrow

(c) Liver

(d) Circulatory system

17. BCG is used to protect against

(a) Tuberculosis

(b) Rabies

(c) Hepatitis B

(d) Pertussis

18. Which of the following diseases has been completely eradicated world–wide?

(a) Measles

(b) Smallpox

(c) Tuberculosis

(d) Cowpox

19. Complement component C3 is cleaved by

(a) C3b

(b) C3bBb

(c) Factor B

(d) Factor D

20. Which of the following is not an antigens

(a) proteins

(b) lipoprotein

(c) Glycoprotein

(d) NaCl

21. What is the name of the hypervariable region of immunoglobin, which is responsible for its diversity?

(a) Complementarity-determining regions (CDRs)

(b) Hinge region

(c) Epitope

(d) Fc region

22. Name the heavy chain of immunoglobulin G.

(a) μ (b) ε

(c) α (d) γ

23. A potent antigen is capable of

(a) inducing an immune response

(b) can interact with antibody

(c) induces antibody production

(d) all of these

24. A molecule that helps to produce antibody but is not immunogenic by itself is called

(a) linker

(b) antigen

(c) hapten

(d) immunogen

25. Life span of naive T-cells ————————

(a) 4-5 hours

(b) 4-5 days

(c) 4-5 weeks

(d) 4-5 years

26. Which of the following cells are called competent lymphocytes?

(a) T lymphocytes

(b) B lymphocytes

(c) C lymphocytes

(d) S lymphocytes

27. Number of lymphocytes present in a health human is _____

(a) 1 trillion (b) 1 million
(c) 1 billion (d) 10 trillion

28. Antibody can not be linked with the following for detection purpose
(a) 1251
(b) FITC
(c) Europium 3 +
(d) Horseradish peroxidase

29. An Ig G antibody has
(a) two paratope and one Fc region
(b) two paratope and two Fc region
(c) one paratope and one Fc region
(d) one paratope and two Fc region

30. Influenza vaccine should be taken ever year because _____
(a) due to higher mutation rate by its error-born RNA polymerase
(b) due to climate change
(c) due to long living nature of the virus
(d) due to poor antigenicity of the vaccine

Part B (10 × 2 = 20)

Answer any **ten** questions.

31. What do you mean by pathogen associated molecular pattern?

32. What are the components innate immunity?

33. What are cytokines?

34. What is an adjuvant?

35. What is agglutination?

36. What are microarrays?

37. What is passive immunization?

38. What is reverse vaccinology?

39. What is autoimmunity?

40. What is the immunological basis of graft rejection?

41. What is HLA typing?

42. Differentiate pandemic and epidemic.

Part C $(5 \times 5 = 25)$

Answer any **five** questions.

43. What is cell mediated immunity? Explain in detail about T-cell immunity.

44. Write an essay on the principle, reagents. performance and applications of RIA.

45. Give an account of different vaccines available for Covid-19.

46. What are epitopes? Add a note on B cell epitopes.

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

48. What is Ag-Ab interaction? Write an account on different Ag-Ab reactions.

49. Compare antigen presentation by class I and Class II MHC molecules.

50. Explain the pathway of CD4 T-cell activation.

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R6706	Sub. Code
	501203

M.Sc. DEGREE EXAMINATION, APRIL – 2022

Second Semester

Biotechnology

BIOINFORMATICS

(CBCS – 2020 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (30 × 1 = 30)

Answer **all** questions.

1. Identify the OS which is not based on Linux.

   (a) Ubuntu (b) Fedora

   (c) BSD (d) CentOS

2. Which of the following UNIX / Linux command is used to compress files?

   (a) cmp (b) comp

   (c) gunzip (d) gzip

3. Literature databases include

   (a) MEDLINE and PubMed

   (b) PubMed and PDB

   (c) MEDLINE and PDS

   (d) MEDLINE and PDB

4. SCOP is a

(a) Primary database

(b) Structural database, which identity structural and evolutionary relationships

(c) Protein Function database

(d) Hierarchical classification of protein 2D domain structures

5. InterPro is an integrated protein ———————— database

(a) sequence (b) structure

(c) interaction (d) family

6. TrEMBL is

(a) an automatically annotated composite protein sequence database

(b) an automatically annotated supplement to the EMBL database

(c) a translation of coding sequences in the EMBL database

(d) an automatically annotated supplement to the InterPro database

7. In PROSITE, the term PATTERN indicates that the entry describes a

(a) fuzzy regular expression

(b) regular expression

(c) block

(d) profile

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. The identification of drugs through the genomic study is called ————————

(a) Pharmacogenomics

(b) PharmacoDrug

(c) GenoChem

(d) GenoDrug

10. Which one of the following methods is not used in pairwise sequence alignment?

(a) Dot matrix analysis

(b) Dynamic programming algorithm

(c) k-tuple method

(d) Support Vector machine

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

(a) 10-20 (b) 30-60

(c) 70- 90 (d) 1- 10

12. Which of the following databases is derived from mRNA information?

(a) HTGS (b) dbEST

(c) PBD (d) OMIM

13. If you perform a multiple sequence alignment of a group of proteins and include a distantly related protein (a divergent member called an "orphan") :

(a) The orphan is typically aligned with the group of proteins

(b) The orphan is typically not aligned with the group of proteins

(c) Both (a) and (b)

(d) None of these

14. Which of the following amino acid is the least mutable in the PAM scoring matrix?

(a) Methionine (b) Glutamine

(c) Alanine (d) Cysteine

15. Which alignment is useful to detect for highly conserved regions in two proteins?

(a) Global (b) Local

(c) Pairwise (d) Multiple

16. BankIt is a sequence submission tool used in

(a) DDBJ (b) PDB

(c) GenBank (d) EMBL

17. CLUSTALX provides a ———————— interface

(a) graphic (b) alignment

(c) command (d) none of the above

18. In a phylogenetic tree, the scaled branch in which the length is proportional to the evolutionary change is shown in ————————

(a) Cladogam (b) Phylogram

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

19. Glycine is _____

(a) Cyclic (b) Chiral

(c) Achiral (d) None of the above

20. Which of the following statements on energy minimization is true?

(a) It is carried out using quantum mechanics

(b) It is used to find a stable conformation for a molecule

(c) It is carried out by varying only bond angles and bond lengths

(d) It stops when a structure is formed with a much greater stability than the previous one in the process.

21. A strongly electronegative atom that is covalently bonded to a hydrogen bond is called a ———————— in a hydrogen-bond.

(a) donor

(b) acceptor

(c) promoter

(d) receptor

22. Which of the following is in correct order of steps involved in homology modeling?

(i) Alignment Correction

(ii) Loop Modeling

(iii) Template Recognition

(iv) Model Validation

(v) Backbone Generation

(vi) Side-Chain Modeling

(vii) Model Optimization

(a) i–iii–vi–ii–iv–vii–v

(b) iii–v–i–vi–ii–iv–vii

(c) i–iii–v–vi–ii–iv–vii

(d) iii–i–v–ii–vi–vii–iv

23. Which of the following is the latest software developed by Google for the prediction of 3D structures of proteins?

(a) CASP

(b) AlphaFold

(c) RoseTTAFold

(d) AutoDock

24. Which of the following is the most correct?

(a) Charged amino acids are never buried in the interior of a protein

(b) All hydrophobic amino acids are buried when a protein folds

(c) Charged amino acids are seldom buried in the interior of a protein

(d) Tyrosine is only found in the interior of proteins

25. I-TASSER method detects structure templates from the PDB by the protein

(a) sequence identity

(b) sequence similarity

(c) fold recognition

(d) none of the above

26. Which of the following software is used for virtual screening?

(a) AutoDock Vina

(b) MODELLER

(c) SwissModel

(d) Gromacs

27. The statement "PubMed includes links to the full text of the journal articles" is

(a) True always

(b) True only if full text is available

(c) False always

(d) None of these

28. PROCHECK tool is used for

(a) Molecular Docking

(b) Molecular Dynamic Simulation

(c) Protein Structure Validation

(d) Protein Structure Prediction

29. The Lipinski's rule of five is used for assessing the ———— of the small molecules.

(a) Docking

(b) Drug likeness

(c) Similarity search

(d) Dynamics simulation

30. The docking is a process by which

(a) two different structures are compared by molecular modeling

(b) a lead compound is simplified by removing excess functional groups

(c) drugs are fitted into their target binding sites using molecular modeling

(d) a pharmacophore is identified

Part B (10 × 2 = 20)

Answer any **ten** the questions.

31. List the applications of computers in biology and medicine.

32. Explain the role of the Unix commands

(a) grep and (b) mkdir.

33. Give a note on Nucleic acid databases.

34. What are the two types of pairwise sequence alignments?

35. List any two gene prediction tools.

36. What are the uses of multiple sequence alignment?

37. What are the tools used to submit new sequences to GenBank?

38. What is bootstrap in phylogenetic analysis?

39. What are consensus secondary structure and its importance?

40. Explain about the buried and exposed residues in protein structure.

41. What do you mean by the threading technique?

42. Explain the difference between PubMed and PubMed Central.

Part C $(5 \times 5 = 25)$

Answer any **five** questions.

43. Write in detail about the Protein and Nucleic acid databases.

44. Describe in detail about the six frame translation and its uses.

45. Explain in detail about the pairwise sequence alignment techniques.

46. Discuss about the gene prediction methods and tools.

47. Explain the use of CLUSTALW and CLUSTALX for multiple sequence alignment.

48. Define force field and explain its importance in protein 3-D structure modeling.

49. Describe the various steps involved in homology modeling of protein 3D structure prediction.

50. Discuss in detail about the Fold recognition and threading methods used for prediction of 3D structures of proteins.

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R6707	Sub. Code 501204

M.Sc. DEGREE EXAMINATION, APRIL – 2022

Second Semester

Biotechnology

GENOMICS AND PROTEOMICS

(CBCS – 2020 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (30 × 1 = 30)

Answer **all** questions.

1. The ability of episomes to insert themselves into chromosomes depends on the presence of short DNA sequences called

   (a) palindromes (b) dNTPs

   (c) IS elements (d) F factor

2. Which of the following statements is incorrect?

   (a) Telomeres of eukaryotic chromosomes have tandem repeat sequences

   (b) Telomeres prevent DNases from degrading the ends of linear DNA molecules

   (c) Telomeres helps in fusion of the ends with other DNA molecules

   (d) Telomeres facilitate replication of the ends of linear DNA molecules

3. The plasmid which is not conjugative is ————————.

(a) R6K (b) F

(c) RI (d) Col El

4. *nad* and *cox* genes are involved in

(a) respiratory electron transport

(b) protein synthesis

(c) ATP synthesis

(d) lipid synthesis

5. A DNA sequence that occurs in more than one of the three genetic systems of eukaryotic cells (the nuclear, mitochondrial, and plastid genomes) is termed as

(a) covalently closed circular DNA

(b) promiscuous DNA

(c) supercoiled DNA

(d) non-promiscuous DNA

6. RFLPs can be used as STS. STS stands for

(a) Small Tandem Sequences

(b) Short Transposable Sequence

(c) Sequence Tagged Sites

(d) Short Transverse Sites

7. The map which shows physical location of genes and help to isolate them by positional cloning is

(a) physical map

(b) genetic map

(c) cytological map

(d) chromosome map

8. RFLP can be scored by

(a) in situ hybridization

(b) Random genomic sequences

(c) DNA Chip technology

(d) Southern hybridization

9. A good target for high-resolution fluorescence *in situ* hybridization (FISH) is

(a) metaphase chromosome

(b) interphase chromosome

(c) centromere

(d) sister chromatid

10. The marker which is based on amplification of selected restriction fragments is

(a) RAPD (b) RFLP

(c) AFLP (d) SNP

11. ———————— blocks the de novo synthetic pathway confining DNA synthesis to salvage pathway

(a) Thymidilic acid (b) Thymine

(c) Aminopterin (d) Hypoxanthine

12. A LOD score of ———————— or higher is accepted as evidence for linkage

(a) 1.0 (b) 1.5

(c) 5.0 (d) 3.0

13. The size of human genome is ———————— bp.

(a) 3.2 billion (b) 3.0 million

(c) 2.5 billion (d) 8.2 billion

14. Which of the following is a genome browser?

(a) RCSB (b) UCSC

(c) InterPro (d) PROSITE

15. The average number of times a genomic segment is represented in a collection of clones or sequence reads is termed as

(a) minimal tiling path

(b) contig

(c) draft

(d) coverage

16. The process of new combinations of exons created by recombination within the intervening sequences yielding rearranged genes with altered function is called

(a) RNA splicing

(b) exon shuffling

(c) intron deletion

(d) homeostasis

17. The sequence identity of orthologs between the pufferfish and humans is

(a) 30% (b) 40%

(c) 61% (d) 79%

18. The *rpoB* gene confers resistance to

(a) rifampicin (b) ampicillin

(c) hygromycin (d) cefotaxime

19. The size of 16S rRNA gene sequence is

(a) 10 kb (b) 0.2 kb

(c) 3.2 kb (d) 1.5 kb

20. If an SNP does not change the polypeptide sequence, it is referred as

(a) missense

(b) nonsense

(c) synonymous

(d) non-synonymous

21. In isoelectric focusing, electrophoresis is carried out in a

(a) density gradient

(b) pH gradient

(c) electrochemical gradient

(d) voltage gradient

22. SDS confers proteins a uniform

(a) negative charge

(b) positive charge

(c) pH value

(d) mass

23. Quassimolecular ions are produced by addition of a proton to give $(M+H)^+$ in

(a) Fast Atom Bombardment

(b) Electrospray Ionization

(c) Field Ionization

(d) all the above

24. A mass analyzer that determines the mass : charge ratio of an ion by measuring the time taken by ions to travel down a flight tube to the detector is

(a) CID (b) ESI

(c) quadrupole (d) TOF

25. Yeast two-hybrid system is mainly used for

(a) identifying novel protein-protein interactions

(b) identifying DNA sequences

(c) quantifying proteins

(d) detecting chromosomal aberrations

26. The RNA sequence data can be aligned to genome using aligners such as

(a) BLASTP (b) TBLASTX

(c) Bowtie2 (d) MUSCLE

27. ———— are a set of overlapping DNA fragments that are obtained from a single genetic source

(a) Genomes (b) Contigs

(c) Concatamers (d) Amplicons

28. TALENs stand for

(a) Transcription Activator-Like Effector Nucleases

(b) Termination Activator-Like Effector Nucleases

(c) Transcription Activator-Like Enhancer Nucleases

(d) Termination Activator-Like Enhancer Nucleases

29. ———— region of antibody binds to antigen

(a) Fc (b) Fab

(c) Hinge (d) Papain cleavage

30. Which of the following is a glycolipid?

(a) Ganglioside

(b) Sphingomyelin

(c) Phosphatidylcholine

(d) Chylomicron

Part B (10 × 2 = 20)

Answer any **ten** questions.

All questions carry equal marks.

31. Differentiate negative supercoiling and positive supercoiling of prokaryotic DNA.

32. Mitochondrial genome exists as diverse structures. Justify.

33. What are VNTRs?

34. How genetic mapping is carried out using FISH technique?

35. List the outcomes of *S. cerevisiae* genome project.

36. What are contigs? How are they generated?

37. Give five applications of SNP genotyping.

38. Write the steps involved in horizontal gene transfer.

39. State the principle of isoelectric focusing.

40. Mention the type of annotations used in proteome databases.

41. What is chromosome walking?

42. How secondary metabolites differ from metabolome? Give two examples of secondary metabolite.

Part C

$(5 \times 5 = 25)$

Answer any **five** questions.

All questions carry equal marks.

43. Detail the organization of eukaryote chromosome with a neat diagram.

44. Illustrate AFLP. State the principle and its significance.

45. How genes can be mapped using in situ hybridization?

46. What sequencing approach was followed in Human Genome Project? Explain.

47. Brief the significance of comparative genomics in tracking emerging diseases and discovery of novel drugs.

48. Give the principle, process and applications of yeast two-hybrid screening.

49. Discuss and differentiate the features of forward and reverse genetics. List their applications.

50. Draw a schematic overview of the metagenomic approach and state its limitations.

R6708

Sub. Code
501205

M.Sc. DEGREE EXAMINATION, APRIL – 2022

Second Semester

Biotechnology

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 A•T base pairs are held together by ———— hydrogen bonds

   (a) two (b) three

   (c) four (d) six

2. In a protein, each amino acid is linked to an adjacent amino acid by a

   (a) disulfide bond (b) hydrogen bond

   (c) peptide bond (d) phosphodiester bond

3. The amount of DNA required to wrap around the histone octamer is

   (a) 120 bp (b) 86 bp

   (c) 146 bp (d) 200 bp

4. During inter phase, chromatin organized into loops are anchored to the
   (a) outer nuclear membrane
   (b) nuclear matrix
   (c) inner nuclear membrane
   (d) nuclear pore

5. In DNA fingerprinting of human identification, biological samples (such as hair/bones/teeth) that lack nucleate cellular materials can be analyzed with
   (a) snRNA
   (b) ctDNA
   (c) RNA-DNA hybrids
   (d) mtDNA

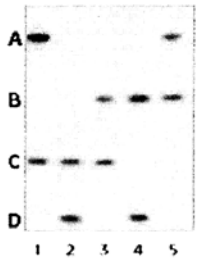
6. The role of MgCl2 in PCR is, it
   (a) binds to 3'-OH of the DNA
   (b) increases the activity of *Taq* DNA polymerase
   (c) breaks phosphodiester bonds of DNA
   (d) none of the above

7. Which of the following is a specific feature of Multiplex PCR?
   (a) Multiple primers can be used in a single reaction
   (b) Multiple additives can be added in a single reaction
   (c) Multiple polymerases can be used for a single reaction
   (d) Multiple reaction buffers can be used for a single reaction

8. FISH uses _____ probe to detect breast cancer
   (a) APOE (b) ERG
   (c) HER-2 (d) CYP

9. The blocking agent used in ELISA is
   (a) bovine serum albumin
   (b) biotin
   (c) serum apolipoprotein
   (d) fluorescein

10. Results from a single locus probe DNA fingerprint analysis for a man and his four different children are shown in the figure. Which lane contains the DNA of the father?



   (a) Lane 1 (b) Lane 2
   (c) Lane 3 (d) Lane 4

11. In conformation-sensitive capillary electrophoresis (CSCE), under mildly denaturing conditions DNA homoduplexes and heteroduplexes
   (a) do not migrate in the gel
   (b) migrate at uniform rates
   (c) starts migrating at different time points
   (d) migrate at different rates

12. _____ is a bioluminescence method that measure the release of inorganic pyrophosphate by converting it proportionally into visible light signals
   (a) Sequencing by ligation (SBL)
   (b) Pyrosequencing
   (c) Single Molecule Real Time (SMRT)
   (d) Solid-phase amplification

13. The Cy3 label fluoresces
    (a) red (b) green
    (c) yellow (d) blue

14. SCARs stand for
    (a) Sequence Characterized Amplified Regions
    (b) Sequence Classified Amplified Regions
    (c) Structure Characterized Amplified Regions
    (d) Structure Classified Amplified Regions

15. Expressed Sequence Tags (ESTs) are prepared from
    (a) transfer RNA (b) single stranded DNA
    (c) ribosomal RNA (d) complementary DNA

16. Which of the following is a polar organic solvent?
    (a) Cyclohexane (b) Benzene
    (c) Ethanol (d) Petroleum ether

17. _____ is an amino acid metabolism disorder
    (a) Glucose intolerance
    (b) Phenylketonuria
    (c) Hyperlipidemia
    (d) Fructose intolerance

18. Fructose-6-phosphate is converted to Fructose-1, 6-diphosphate by the action of
    (a) phosphoglucomutase
    (b) phosphofructokinase
    (c) aldolase
    (d) phosphotransferase

19. The lowest form of electromagnetic radiation which is used in NMR is
    (a) radio waves (b) micro waves
    (c) infrared (d) ultraviolet

20. The mode of action of ampicillin is
    (a) inhibition of DNA synthesis
    (b) inhibition of RNA synthesis
    (c) inhibition of cell wall synthesis
    (d) inhibition of protein synthesis

21. Which of the following detection methods show higher diagnostic sensitivity of pathogens?
    (a) ELISA
    (b) Immunosensors
    (c) Rapid Antigen Test
    (d) PCR

22. The pattern of inheritance shown by Fragile X syndrome affected individual is
    (a) X-linked
    (b) Y-linked
    (c) autosomal dominant
    (d) autosomal recessive

23. Which of the following statements is true?
    (a) More number of CTG repeats indicate severe Fragile X syndrome
    (b) More number of CGG repeats indicate severe Fragile X syndrome
    (c) Less number of CGG repeats indicate severe Fragile X syndrome
    (d) Less number of CTG repeats indicate severe Fragile X syndrome

24. One of the techniques which is used to detect intragenic deletions or duplications in von Hippel-Lindau Syndrome is
    (a) quantitative PCR
    (b) reverse transcription PCR
    (c) emulsion PCR
    (d) colony PCR

25. The hypoxia-inducible factor (HIF1α) degradation is due to the regulation of hypoxia-inducible genes through targeted

(a) acetylation (b) sialylation

(c) ubiquitinylation (d) methylation

26. Which of the following genes is often defective (mutated) in individuals with a genetic predisposition to forming colorectal cancer?

(a) BRCA1 gene (b) hTERT gene

(c) APC gene (d) P^{53} gene

27. Any change during cell division that results in loss or gain of one or more chromosomes is known as

(a) euploidy (b) aneuploidy

(c) monoploidy (d) polyploidy

28. The chemotherapy drug Taxol targets ———— during mitosis.

(a) Nuclear envelope (b) ribosomes

(c) Microtubules (d) Mitochondria

29. Which of the following are the tumor biomarkers for lung cancer

(a) Carcinoembryonic antigen (CEA)

(b) squamous cell carcinoma antigen (SCC)

(c) neuron-specific enolase (NSE)

(d) All of the above

30. Wolf-Hirschhorn syndrome is caused due to abberations on which Chromosome

(a) 4 (b) 6

(c) 8 (d) 1

Part B (10 × 2 = 20)

Answer any **ten** questions.

All questions carry equal marks.

31. Differentiate euchromatin and heterochromatin.

32. List the applications of DNA fingerprinting.

33. ARMS-PCR can detect single base substitutions. Justify.

34. How proteins can be detected through SELDI-TOF mass spectrometry?

35. What is the metabolome of an individual? Give the importance of diagnostic metabolomics.

36. Illustrate the workflow of LCMS technique.

37. Mention four antibiotic resistance selectable marker genes.

38. What are CpG islands?

39. How does von Hippel-Lindau disease inherited?

40. List the high throughput genotyping platforms used for detection of recognized genetic aberrations in clinical cancer samples.

41. List the biomarkers of colon cancer.

42. State the regulations for quality assurance and control.

Part C

$(5 \times 5 = 25)$

Answer any **five** questions.

All questions carry equal marks

43. How does DNA polymorphism play an important role in drug metabolism? Give an example.

44. Detail the steps involved in FISH technique.

45. Briefly explain the automation processes involved in NGS library preparation.

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

47. Discuss various techniques used in detection and identification of pathogenic microbes.

48. What causes fragile X syndrome? Give the diagnostic and treatment strategies.

49. Brief the types of targeted onco-therapies to overcome toxicity of standard therapies.

50. Discuss the genetic background, diagnosis and treatment/therapy of chronic myeloid leukemia

———————

R6709

Sub. Code
501206

M.Sc. DEGREE EXAMINATION, APRIL – 2022

Second Semester

Biotechnology

RESEARCH METHODOLOGY AND SCIENTIFIC COMMUNICATION SKILLS

(CBCS – 2020 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (30 × 1 = 30)

(MCQ or Fill in the Blank Type Questions)

Answer **all** questions.

1. A researcher designed an experiment and found the genome size of corona virus is 30Kb. The data can be categorized as ————————

   (a) preliminary data

   (b) experimental data

   (c) empirical data

   (d) none of the above

2. The research antagonistic of ex-post facto research is

   (a) Experimental studies

   (b) Normative researches

   (c) Library researches

   (d) All of above

3. Which is not a feature of a research proposal?

(a) A short literature review

(b) A section of how data will be analyzed

(c) A discussion of findings

(d) Proposed data collection methods

4. Empirical research is associated to

(a) Theory (b) Observation

(c) Critical thinking (d) None of the above

5. What does the longitudinal research approach actually deal with?

(a) long -term research

(b) horizontally research

(c) short term research

(d) none of the above

6. What is the use of Factorial Analysis?

(a) For setting the hypotheses

(b) To understand the difference between two variables

(c) To understand the relationship between two variables

(d) To understand the difference between various variables

7. The data of research is

(a) Qualitative type (b) Both (a) and (c)

(c) Quantitative type (d) none of the above

8. What do you consider as the main aim of inter disciplinary research?

(a) To over simplify the problem of research

(b) To bring out holistic approach to research

(c) To create a new trend in research methodology

(d) To reduce the emphasis of single subject in research domain

9. A research problem is feasible only when

(a) it is researchable

(b) it has utility and relevance

(c) it is new and adds something to knowledge

(d) all the above

10. Books and Records are the primary sources of data in:

(a) Clinical research

(b) Historical research

(c) Laboratory research

(d) None of these

11. Acknowledgement in a research article is to

(a) describe methods

(b) thank those who helped to complete the work

(c) explain result

(d) cite an article

12. A null hypothesis is

(a) subjective in nature

(b) the same as research hypothesis

(c) when there is difference between two variables

(d) when there is no difference between variables.

13. Which of the following computer generation uses concept of artificial intelligence?

(a) First generation

(b) Third generation

(c) Second generation

(d) Fourth generation

14. A formal document that presents the research objectives, design of achieving these objectives, and the expected outcomes of the study is called

(a) Research design (b) Research hypothesis

(c) Research proposal (d) Research report

15. Observation is the direct method of collecting

(a) Primary data (b) Both (a) and (c)

(c) Secondary data (d) Published data

16. In oral communication there is a possibility of immediate

(a) Reactions (b) Reset

(c) Responses (d) None of the above

17. IRB in a review stands for

(a) Internal Review board

(b) Institutional review board

(c) Internal report board

(d) All the above

18. URKUND is a software for

(a) Adding references

(b) Grammar checker

(c) Plagiarism checker

(d) Manuscript editing

19. What is h-index?

(a) a metric for evaluating the cumulative impact of an author's scholarly output and performance

(b) a metric for evaluating the cumulative impact of publications output and performance

(c) a metric for evaluating the cumulative impact of book chapters output and performance

(d) none of these

20. What is a research design?

(a) A way of conducting research that is not grounded in theory

(b) The choice between using qualitative or quantitative methods

(c) The style in which you present your research findings, e.g. a graph

(d) A framework for every stage of the collection and analysis of data

21. End note is software for

(a) Adding references

(b) Both (a) and (c)

(c) Online editing tool

(d) None of these

22. Which is not a level of qualitative analysis?

(a) Descriptive statistics

(b) Thematic analysis

(c) Multivariate analysis

(d) Informational analysis

23. What is a virtual ethnography?

(a) The use of visual data rather than written texts for content analysis

(b) A technique used to facilitate online focus groups

(c) A study that uses participant observation but not interviewing

(d) An ethnographic study of an online community or social setting

24. Facts or information's are analysed and critical evaluation is made in

(a) Survey

(b) Action research

(c) Analytical research

(d) Pilot study

25. In, _____ the interviewer and members jointly control the pace and direction of the Interview.

(a) Field interview (b) Telephonic interview

(c) Both (a) and (b) (d) None of the above

26. Which of the following method of data collection is not used in the case study?

(a) Questionaries (b) Correlation data

(c) Following groups (d) Secondary data

27. Which of these is not a step in the problem identification process?

(a) Discussion with subject experts

(b) Review of existing literature

(c) Theoretical foundation and model building

(d) Management decision making

28. According to hoben communication is the ———— Interchange of thought or idea.

(a) Visual (b) Written

(c) Audio (d) Verbal

29. The language of a report should be

(a) Formal (b) In formal

(c) Casual (d) letter type

30. In ———— the main purpose is to formulate a problem for more precise investigation.

(a) Exploratory or Formulative study

(b) Diagnostic study

(c) Descriptive study

(d) None of these

Part B (10 × 2 = 20)

Answer any **ten** questions.

31. What is Descriptive Research?

32. How would you define a research problem?

33. Define holistic biology.

34. Characteristics of a good research report

35. Explain the barriers for effective communication.

36. List out the steps for scientific poster preparation.

37. What is scientific search engine?

38. What Are the Qualities of a Good Mentor?

39. How can we prevent Un ethical research?

40. Define Literature Review.

41. What is peer review and its primary goal.

42. What are the characteristics of a poster?

Part C $(5 \times 5 = 25)$

Answer any **five** questions.

43. Describe the different types of research, clearly pointing out the differences between an experiment data and survey-based data.

44. What is a scientific publication? Explain the types of publications

45. What are the sampling methods in qualitative research?

46. Mention the guidelines for writing a dissertation.

47. Explain the different types of report, particularly pointing out the differences between a technical report and a popular report.

48. Elucidate the different styles of referencing in a research paper.

49. How do you present your research work in PowerPoint?

50. Detail how to write a research article.

R6710	Sub. Code
	501207

M.Sc. DEGREE EXAMINATION, APRIL – 2022

Second Semester

Biotechnology

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. *lacZ* gene codes for
   (a) galactose permease
   (b) β -galactosidase
   (c) lactose
   (d) lactase

2. When lactose is absent, ———————— blocks the promoter site and prevents settling of RNA polymerase.
   (a) promoter protein (b) suppressor protein
   (c) repressor protein (d) glucose

3. Which of the following is a mutagen?
   (a) H_2O (b) UV rays
   (c) IR rays (d) Microwaves

4. A phage count is valid when the number of plaques per plate is

(a) 250 (b) 600

(c) 10 (d) 2

5. Which of the following is not a bacteriophage?

(a) T4 (b) T12

(c) Phi X 174 (d) Beta X 174

6. Transfer of genetic material between two bacteria through virus is termed as

(a) transduction (b) transformation

(c) conjugation (d) budding

7. Eukaryotic cell lacks

(a) nucleus

(b) plasma membrane

(c) pili

(d) motor proteins

8. An absorbance ratio ($A_{260/280}$) ratio of more than 2.0 of a DNA sample represents

(a) pure DNA

(b) contamination with protein

(c) contamination with amino acids

(d) contamination with RNA

9. *nptII* gene confers resistance to

(a) ampicillin

(b) kanamycin

(c) carbenicillin

(d) chloramphenicol

10. Restriction endonucleases which recognize asymmetric DNA sequence and cleave at a position (normally 1-20 nt) away from the recognition site belong to

(a) Type II (b) Type IIS

(c) Type III (d) Type IIZ

11. *HindIII* is isolated from the bacterium

(a) *Haemophilus influenza*

(b) *Escherichia coli*

(c) *Bacillus subtilis*

(d) *Helicobacter pylori*

12. Agarose is a polysaccharide made up of D-galactose and 3,6-anhydro-α-L-galactopyranose residues linked together by

(a) α-(1$\rightarrow$4) and β-(1$\rightarrow$2) linkages

(b) α-(1$\rightarrow$2) and β-(1$\rightarrow$4) linkages

(c) α-(1$\rightarrow$4) and β-(1$\rightarrow$3) linkages

(d) α-(1$\rightarrow$3) and β-(1$\rightarrow$4) linkages

13. The charge of DNA loaded in agarose gel is

(a) positive (b) negative

(c) zero (d) neutral

14. Product(s) of PCR is/are termed as

(a) amplicon

(b) polynucleotide

(c) oligo

(d) triplex DNA

15. Additives can increase the yield of PCR. Which of the following is not a PCR additive?

(a) DMSO

(b) Betaine

(c) Ribonuclease

(d) Polyethylene glycol

16. T4 DNA ligases require ———————— as a cofactor.

(a) GDP (b) NAD+

(c) ATP (d) NADP+

17. The insert size range of λ phage vector is

(a) 50 kb – 100 kb (b) 5kb – 25kb

(c) 1 kb – 2kb (d) 0.5kb – l kb

18. In the process of competent cell preparation, the pH of LB medium to grow *E. coli* cells is

(a) 9.2 (b) 6.2

(c) 3.0 (d) 7.2

19. Heat shock transformation is performed at

(a) 0°C (b) 28°C

(c) 65°C (d) 42°C

20. In a colony PCR, ———————— is used to directly disperse the bacterial colonies.

(a) NaOH (b) NH_4HCO_3

(c) NaH_2PO_4 (d) $MgCl_2$

21. Tool used to identify the restriction sites in a DNA sequence is

(a) NEBcutter

(b) Primer-BLAST

(c) MUSCLE

(d) EMBOSS Needle

22. The expressed protein at times are insoluble and accumulate in

(a) peroxisomes (b) inclusion bodies

(c) cytoplasm (d) ribosomes

23. Which of the following methods is not used to identify proteins?

(a) SDS-PAGE (b) Western blot

(c) Northern blot (d) GC-MS

24. ———————— tag binds to immobilized nickel ions with high specificity and affinity.

(a) Glycine (b) Ammonium

(c) Histidine (d) Arginine

25. What does NTA in Ni-NTA stand for?

(a) Nitrilotetraacetic acid

(b) Nitrilotriacetic acid

(c) Nitrogen oxoacid

(d) Terephthalic acid

26. The loss of incorporated label in random primer labelling can be avoided by the use of

(a) Ribozymes

(b) Taq polymerase

(c) Type II restriction endonuclease

(d) Klenow fragment

27. Radioactive labelling of one or more ———————— enables nascent strand also to be radioactive.

(a) dNTPs

(b) enzymes

(c) ddNTPs

(d) both (a) and (b)

28. Southern blotting is used to analyze

(a) RNA (b) proteins

(c) DNA (d) lipids

29. In an alkaline solution, charge of the nitrocellulose membrane is

(a) positive

(b) negative

(c) zero

(d) both positive and negative

30. Resistance to ampicillin is conferred by ———————— gene.

(a) *tet* (b) *bla*

(c) *kan* (d) *aph*

Part B (10 × 2 = 20)

Answer any **ten** questions.

All questions carry equal marks.

31. What does a diauxic growth curve represent?

32. What are amino acid auxotrophs?

33. Write a short note on plaque assay.

34. Mention the components of TE buffer and their role in plasmid isolation.

35. Define star activity.

36. From 20X TAE stock buffer (1000 ml), calculate the volume required to prepare 250ml of 1X running buffer.

37. List four applications of PCR.

38. Write in short, the role of T4 DNA ligases.

39. Brief the principle on how bacterial cells are made competent chemically?

40. How transformation efficiency of bacteria can be calculated?

41. What are inclusion bodies and where are they localized in *E. coli*?

42. State the working principle of random primer labelling.

Part C (5 × 5 = 25)

Answer any **five** questions.

All questions carry equal marks.

43. What are auxotrophs? How amino acid auxotrophs of bacteria can be isolated through UV mutagenesis?

44. Give a brief account on Restriction Endonucleases with examples.

45. Define PCR. How primers can be designed?

46. How a vector and insert can be ligated? Explain in detail.

47. Brief the steps involved in transformation of plasmids into E. coli. List few applications of bacterial transformation.

48. Illustrate the following methods:

    (a) Colony PCR

    (b) Restriction Mapping

49. Elaborate the processes of sample preparation and analysis of proteins by SDSPAGE.

50. Give a detailed account on the steps of Southern hybridization.

———————

R6711

Sub. Code
501208

M.Sc. DEGREE EXAMINATION, APRIL – 2022

Second Semester

Biotechnology

LAB V — IMMUNOLOGY

(CBCS – 2020 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (30 × 1 = 30)

Answer **all** questions.

1. Which of the following method is based on the classic percipitin reaction in which antigen and antibodies react to form precipitates in liquid or semi-fluid media?
   (a) Ouchterlony method
   (b) Radial Immunodiffusion method
   (c) Direct ELISA
   (d) Sandwich ELISA

2. In peripheral blood smear analysis, ———————— stain is used.
   (a) Romanowsky stains
   (b) Giemsa stain
   (c) Wright's stain
   (d) All of the above

3. Which of the following best explains the process of agglutination?
   (a) Protein-protein interaction
   (b) Protein-RBC interaction
   (c) Protein-WBC interaction
   (d) None

4. Which among the following is a secretory immunoglobulin?

(a) IgA (b) IgG

(c) IgD (d) IgE

5. ———————— is used for monoclonal antibody production.

(a) Myeloma cells (b) Spleen cells

(c) Plasma cells (d) Hybridoma cells

6. Expand PMT in FACS.

(a) Pre medical test

(b) Photomultiplier cells

(c) Photoelectric tube

(d) Primary multiplier tube

7. In spectrometry, the absorbance at 280 denotes

(a) Wavelength (b) Frequency

(c) Oxidation (d) Electromagnetic energy

8. Dextran is a ————————.

(a) Polysaccharide (b) Disaccharide

(c) Enantiomer (d) Isomer

9. In Neutrophil isolation, pulse vortex or minimum vortex is recommended. Why?

(a) Pulse vortex or minimum vortex causes enzymatic digestion of neutrophils

(b) Pulse vortex or minimum vortex prevents activation of neutrophils

(c) Pulse vortex or minimum vortex increases adhesion in neutrophils

(d) Pulse vortex or minimum vortex decreases granularity of neutrophils

10. Which of the following is the reason for light sensitivity of ficoll?

(a) Sodium diatrizoate is light-sensitive

(b) Sodium benzoate is light-sensitive

(c) Sodium malate is light-sensitive

(d) Sodium pyruvate is light-sensitive

11. Which among the following statement is not true about TTBS?

(a) TTBS is used as wash buffer

(b) Tween 20 in TTBS eliminates fat from the membrane

(c) TTBS maintains pH at 7.4

(d) TTBS exhibits interactions with immune cells

12. What is the RPM value if the radius of the rotor = 13 cm and RCF = 10000?

(a) 8287 (b) 2621

(c) 8254 (d) 26207

13. Density gradient centrifugation is based on ————————.

(a) Particle size (b) Mass

(c) Density (d) Density and size

14. HBSS media is used without calcium or magnesium in neutrophil separation.Why?

(a) Ca/Mg increases adhesion in neutrophils

(b) Ca/Mg causes enzymatic digestion of neutrophils

(c) Ca/Mg decreases granularity of neutrophils

(d) Ca/Mg prime/activate neutrophils

15. The pH of stacking and resolving gel in SDS-PAGE is _____.

(a) 6.4, 7.4 (b) 6.8, 8.8

(c) 7.8, 8.8 (d) 5.8, 8.8

16. Which of the following statement is TRUE regarding Beta-mercaptoethanol in SDS-PAGE?

(a) Imparts uniform negative charge and linearizes your protein

(b) Breaks cysteine-cysteine disulphide bridges

(c) Is an essential catalyst for polyacrylamide gel polymerization

(d) Is an oxidizing agent which is often used with tetramethylethylene diamine

17. Which of the following technique is used in both qualitative and quantitative estimation of protein?

(a) Nanodrop (b) ELISA

(c) RT PCR (d) Autography

18. Which of the statement is true regarding serum?

(a) contains blood cells such as WBC, RBC and clotting factors

(b) is devoid of blood cells and clotting factors

(c) None of the above

(d) Both (a) and (b)

19. Pick out the cryogenic gases

(a) Liquid nitrogen and liquid oxygen

(b) Liquid nitrogen and benzene

(c) Carbon monoxide and oxygen

(d) Liquid nitrogen and liquid helium

20. Which of the following statement is NOT the function of cryoprotectant?

(a) Cryoprotectants are used to prevent ice formation

(b) Cryoprotectants cause damages to biological tissues when freezing the organs

(c) Cryoprotectants are used to protect the cell membrane integrity and intracellular environment

(d) Some of the cryoprotective additives includes dimethylsulfoxide (Me_2SO), glycerol, saccharose, glucose, methanol, polyvinylpyrrolidone (PVP), sorbitol and malt extract.

21. A pattern of crossed lines/intersect in Ouchterlony double diffusion method indicate ————————

(a) Common epitope

(b) Partial identity

(c) Identity

(d) Nonidentity

22. ———————— involves the separation and identification of proteins based on the differences in electrical charge and reactivity with antibodies.

(a) Agarose gel electrophoresis

(b) Polyacrylamide gel electrophoresis

(c) Immuno electrophoresis

(d) None of the above

23. The primary stain and counter stain used in gram staining are

(a) Crystal violet and Safranin

(b) Romanowsky Stains–Giemsa Stains

(c) Hematoxylin and Eosin

(d) None of the above

24. ———————— is the disruption of erythrocyte membranes which causes the release of hemoglobin.

(a) Autophagy

(b) Haemolysis

(c) Plasmolysis

(d) None the above

25. Which of the following ELISA technique is used for antibody detection?

(a) Antibody coated fluorescence

(b) Antigen coated enzyme

(c) Antibody coated enzyme

(d) Antigen coated fluorescence

26. ———————— is an asymptomatic primary immune response to antigen.

(a) Immunization

(b) Hypersensitivity

(c) Sensitization

(d) Allergy

27. Which of the following polymer is used to make latex bead?

(a) Plastic

(b) Polytene

(c) Polystyrene

(d) Rubber

28. Which among the following is a granulocyte?

(a) Mast cell

(b) Macrophage

(c) RBC

(d) Neutrophils

29. Which among the following ELISA technique is used to screen antigen?

(a) Direct ELISA

(b) Indirect ELISA

(c) Sandwich ELISA

(d) Competitive ELISA

30. Expression of lac operon is activated only when _____

(a) Lactose levels outside the cell are low and glucose levels are high

(b) Lactose levels outside the cell are high and glucose levels are low

(c) Both lactose and glucose levels are equal inside the cell

(d) Both lactose and glucose levels are equal outside the cell

Part B $(10 \times 2 = 20)$

Answer any **ten** questions.

31. Explain the principle behind the identification of antigens by complement fixation test.

32. Discuss the principle functions of different types of immunoglobulins.

33. Tabulate the differences between thick and thin blood smears.

34. Explain the role of different kinds of leucocytes with clear diagrams.

35. Explain the steps involved in phagocytosis.

36. Mention the principle of preservation by cryoprotectant with suitable examples.

37. Explain the types of immunodiffusion.

38. Mention the graphical localization of different kinds of leukocytes in dot plot

39. Describe the principle of Ponceau S staining with an application.

40. List the components and biomolecules present in serum and plasma.

41. Explain the different types of ELISA with suitable diagrams.

42. How is the quantity of antigen interpreted in Radial immunodiffusion?

Part C $(5 \times 5 = 25)$

Answer any **five** questions.

43. Explain the methods of blood collection from different regions. Add a note on types of laboratory animals.

44. Explain the term antibody titer and its determination by the ELISA method.

45. Explain the principle of Giemsa Stain and its applications.

46. Explain the methods used for the measurement of phagocytosis.

47. Describe the four methods employed in the preparation of a blood smear.

48. Describe the principles involved in the protein separation technique, SDS-PAGE.

49. Describe the cell sorting technique FACS and its role in sorting cells in mitotic events.

50. Discuss in detail about the separation of cellular components by sucrose density gradient method.

———————

R6712	Sub. Code
	501502

M.Sc. DEGREE EXAMINATION, APRIL – 2022

Biotechnology

Elective – DRUG DISCOVERY AND DEVELOPMENT

(CBCS – 2020 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (30 × 1 = 30)

Answer **all** questions.

1. The first step in the drug discovery process is
   (a) Lead Modification
   (b) Lead Identification
   (c) Lead Optimization
   (d) Lead Validation
2. Lipinski's rule of five is used for
   (a) Docking
   (b) Similarity search
   (c) Drug likeness
   (d) Dynamics simulation
3. The safety of the candidate drug in humans is studied in
   (a) Phase I
   (b) Phase II
   (c) Phase III
   (d) Phase IV

4. A typical messenger for a tyrosine kinase linked receptor is

   (a) growth factors

   (b) cytokines

   (c) insulin

   (d) acetylcholine

5. Which of the following are not correct based on clinical trials?

   (a) Biomedical research studies

   (b) Behavioral research studies

   (c) Studies on human subjects

   (d) Study based only on animals

6. What is a placebo?

   (a) The subjects do not know which study treatment they receive

   (b) Patients injected with active drug doses

   (c) Fake treatment

   (d) Signed document of the recruited patient for the clinical trial procedures

7. For which of the following FDA is not at all responsible?

   (a) Foods

   (b) Radiation-emitting devices

   (c) Cosmetics

   (d) Vehicles

8. What is the full form of GMP?

   (a) Good manufacturing provisions

   (b) Good Monitoring prohibitions

   (c) Good medical practices

   (d) Good manufacturing practice

9. GCP includes protection of Human rights as a subject in a clinical trial.

(a) True

(b) False

10. A drug shall be _____ if it is an imitation or substitute of another drug.

(a) Misbranded drugs

(b) Spurious drugs

(c) Adulterated drugs

(d) Impure Drugs

11. Which organs comprise the central compartment in a two-compartment model?

(a) Muscles

(b) Skin

(c) Adipose

(d) Liver

12. Which one of these is the correct Michaelis-Menten equation?

(a) $-dC/dt = V\max C/Km + C$

(b) $dC/dt = V\max C/Km + C$

(c) $-dC/dt = V\max C/Km$

(d) $-dC/dt = Km + C/V\max C$

13. Which of the following will be a disadvantage for the physiologic model?

(a) Prediction of drug concentration in various body regions

(b) Correlation of data in several animal species

(c) Obtaining experimental data for each of the organs

(d) The model gives an exact description of the drug concentration-time profile for any organ

14. Which of the following can you copyright?

(a) Literary work

(b) Ideas

(c) Choreographic work

(d) Fashion

15. Which one of these is a genetically determined adverse drug reaction?

(a) Addiction

(b) Teratogenicity

(c) Carcinogenicity

(d) Idiosyncrasy

16. The first edition of IP was published in

(a) 1965 (b) 1975

(c) 1955 (d) 1985

17. Science of collecting, monitoring, researching, assessing, and evaluating information from healthcare providers and patients on the adverse effects of medications is known as

(a) Pharmacovigilance

(b) Clinical trails

(c) Observational study

(d) Qualitative study

18. Who is the person responsible for the conduct of the clinical trial at a trial site?

(a) Clinical Research Coordinator

(b) Monitor

(c) Investigator

(d) Sponsor

19. GCP is seen in all of the following except

(a) Phase I trial

(b) Phase II trial

(c) Preclinical trials

(d) Phase IV trial

20. When two or more drugs are used in combination to increase the pharmacological action, the phenomenon is known as

(a) Synergism

(b) Tolerance

(c) Potentiation

(d) Idiosyncrasy

21. The prescription is an order written by a registered medical practitioner to_____

(a) Patient (b) Pharmacist

(c) Compounder (d) Nurse

22. What is USP?

(a) The United States Pharmacology

(b) The United States Pharmacy

(c) The United States Pharmacopoeia

(d) The United States Pharmaceuticals

23. Acute tolerance is also known as

(a) Addiction (b) Idiosyncrasy

(c) Tachyphylaxis (d) Habituation

24. List of approved drugs and their associated IPR is available in _____

(a) Pink book (b) Orange book

(c) Black book (d) Red book

25. _____ product does not require a Biologics License Application (BLA)

(a) Serum

(b) Glucagon

(c) Blood, blood component, or derivative

(d) Vaccine

26. The passage of drug molecules from a region of higher concentration to lower concentration is known as:

(a) Facilitated Transport

(b) Carrier-mediated transport

(c) Simple diffusion or Passive Transport

(d) Pinocytosis

27. Variables with numerical values are referred to as

(a) Quantitative Variables

(b) Qualitative Variables

(c) Absolute Variables

(d) Continuous Variables

28. Indirect ELISA detects _____ in sample.

(a) Antigen

(b) Antibody

(c) A and B

(d) None of the above

29. Which amino acids are buried deep inside a protein structure?

(a) Either hydrophobic or hydrophilic

(b) Both hydrophobic and hydrophilic

(c) Hydrophilic

(d) Hydrophobic

30. Chaperones are the molecular protein that assists in proper protein folding or prevents them from aggregating.

(a) True

(b) False

Part B $(10 \times 2 = 20)$

Answer **any ten** questions.

31. Define redox potential and pKa.

32. What is Bioisoterism?

33. Write a note on high throughput screening.

34. What are the limitations of in-vitro testing methods?

35. What is CPCSEA?

36. What is the difference between NDA and ANDA?

37. Define the terms quality assurance and quality control.

38. Using examples of simple models introduce the term Molecular Dynamics.

39. Define molecular similarity and similarity searching.

40. Give an account of the GC/MS technique.

41. Compare one way and two ways ANOVA.

42. What is the function of the central drug laboratory?

Part C $(5 \times 5 = 25)$

Answer any **five** questions.

43. Discuss the forces involved in drug-receptor interactions.

44. Write a note on 3-D QSAR. Write differences between 2-D QSAR and 3-D QSAR.

45. Explain types of scoring techniques in docking.

46. Elaborate on phase I studies in Drug Development.

47. Explain sample preparation for high-throughput screening (HTS).

48. What are the cGMP requirements related to premises for pharmaceutical products?

49. ELISA and its types.

50. Methodology opted for accurate mass measurement of small molecules (*ab-initio method*).