PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2025
(Fifth Semester)

Branch – BIOTECHNOLOGY

GENOMICS & PROTEOMICS

Time: Three Hours   Maximum: 50 Marks

SECTION-A (5 Marks)
Answer ALL questions
ALL questions carry EQUAL marks   (5 x 1 = 5)

1   RII mapping is specifically used to
   (i)   Identify mutations in mitochondrial DNA
   (ii) Map recombination events in bacteriophage genetics
   (iii) Study satellite DNA organization
   (iv) Identify SNPs in human genomes

2   BAC libraries are useful for
   (i)   Cloning large fragments of DNA   (ii) Sequencing RNA
   (iii) Protein synthesis   (iv) Gene expression analysis

3   Phage display screening is a technique used to
   (i)   Study DNA-protein interactions
   (ii) Purify proteins based on size
   (iii) Sequence proteins directly
   (iv) Identify and isolate proteins or peptides that bind to specific targets

4   What does metabolomics study in relation to proteomics?
   (i)   The genetic variations in proteins
   (ii) The metabolic profiles of cells and organisms
   (iii) The structure of proteins
   (iv) The interactions between DNA and proteins

5   What role do gene targets play in pharmacogenomics?
   (i)   They provide a blueprint for drug manufacturing.
   (ii) They inhibit the effects of drugs on cancer cells.
   (iii) They serve as markers for drug efficacy and safety.
   (iv) They enhance the absorption of drugs in the body.

SECTION - B (15 Marks)
Answer ALL Questions
ALL Questions Carry EQUAL Marks   (5 x 3 = 15)

6   a   Compare and contrast physical and genetic mapping techniques used to localize genes in the genome.

OR

   b   How do SNPs (Single Nucleotide Polymorphisms) serve as genetic markers in population genetics studies?

7   a   Discuss the significance of Escherichia coli (E. coli) as a model organism in genetic research and biotechnology.

OR

   b   Recall the advantage of exon shuffling in eukaryotic genomes, using specific gene examples.

8   a   Enumerate the limitations of MALDI-TOF in protein analysis.

OR

   b   Brief few methods used to study protein-protein interactions.

Cont...

9   a   Elaborate the concept of PCR Directed Protein Arrays.
OR
     b   Explain the techniques used for metabolite identification in metabolomics.

10   a   Elucidate the role of biomarkers in pharmacogenomics.
OR
     b   Brief the significance of gene target identification in the pharmacogenomics.

SECTION -C (30 Marks)
Answer ALL questions
ALL questions carry EQUAL Marks   (5 x 6 = 30)

11   a   Discuss the role of pseudogenes in the evolution and regulation of genomes. Analyze how pseudogenes originate and their potential functions, including their roles in gene regulation, genome evolution, and disease.
OR
     b   Elucidate how gene duplication events might be identified using bioinformatics tools. Evaluate how gene annotation databases and sequence comparison techniques help identify duplicated genes and their evolutionary significance.

12   a   Explain the significance of the HGP in identifying disease-associated genes and how it has impacted modern healthcare.
OR
     b   How are orthologs and paralogs identified in genome data, and what challenges are associated with their identification?

13   a   Analyze the principle of isoelectric focusing (IEF) and its application in protein characterization.
OR
     b   Expound the different methods of peptide sequencing and their respective advantages.

14   a   Explain the key steps involved in analyzing microarray data. What statistical methods are commonly employed to interpret the data, and how do they help in identifying differentially expressed proteins?
OR
     b   Analyze how structural proteomics can be integrated with genomics and metabolomics to provide a more comprehensive understanding of cellular mechanisms. What benefits does this integration offer?

15   a   Analyze the challenges associated with analyzing large genomic datasets in pharmacogenomics. What strategies can be employed to ensure accurate interpretation of the data for drug development?
OR
     b   Examine the ethical implications of pharmacogenomic research. How can issues such as data privacy, consent, and equity be addressed in the context of personalized medicine?

Z-Z-Z   END