

FIVE YEAR INTEGRATED M.Sc., EXAMINATION 2024
SEMESTER - VII
Paper LS-4-7-2
Methods in Biology - I

Time: Four Hours

Full Marks: 80

Questions are of value as indicated in the margin.
Answer **Question No.01** and **any four** from the rest.

1. Write short notes on **any ten** of the following: 10 x 2 = 20
 - a. PFGE
 - b. Glycome
 - c. BAC
 - d. Agarase
 - e. Salting in
 - f. AFLP
 - g. T4 RNA ligase
 - h. Gel exclusion chromatography
 - i. Electroporation
 - j. Shot gun cloning
 - k. TALEN
 - l. Codon optimization

2. a. Explain how the presently used Sanger's DNA sequencing method is different from its original method and mention its merits. (3+2=5)
b. Write short notes on Northern blotting and Western blotting. (5+5=10)

3. a. Describe one NGS platform where luciferase is used for the sequence detection. (5)
b. Describe similarities and dissimilarities of 2D-PAGE and DIGE. (5)
c. Describe briefly how first strand synthesis using oligo-dT primers are done. State its merits and demerits. (3+1+1=5)

4. a. Describe semi-quantitative PCR, its merits, and demerits. (3+1+1=5)
b. Describe native-PAGE. (5)
c. Write short notes on cloning vector. (5)

5. a. Describe various steps in the genome sequencing of human skin using “Illumina” platform. (10)
- b. Describe how DIG (Digoxigenin) labeled RNA probes can be made. (5)

6. a. One RNA solution gives 0.1 OD at λ_{230} , 0.2 at λ_{260} , and 0.1 at λ_{280} . Find out the concentration of RNA in the solution and comment on its purity with reasons. (1+1=2)
- b. 10 μg of protein is to be loaded on to SDS-PAGE with 6X loading buffer. Protein concentration of the solution is 0.2 $\mu\text{g}/\mu\text{L}$. Find out the amount of protein solution and the 6X loading buffer to be taken. (2)
- c. What is the full form of PCR? (1)
- d. Explain any five uses of PCR explaining change(s) made in their constituents. (10)

7. In a hypothetical scenario Protein X and Protein Y interact with each other to bind genomic DNA in multiple places and influence transcription of many genes in a human cell line.
 Case 1: When Protein X level goes down, transcripts A, B, and C are up-regulated.
 Case 2: When Protein Y level goes down, proteins E, F, and G are down-regulated.
 All different reagents like antibodies, PCR primers, shRNAs, etc., for Protein X and Protein Y are available.
 - a. Design experiment(s) to find out regions of gDNA where Protein X-Protein Y complex binds and discuss the results. (5)
 - b. Design experiment(s) to prove case 1 and discuss the expected results. (5)
 - c. Design experiment(s) to prove case 2 and discuss the expected results. (5)
