

FIVE YEAR INTEGRATED M.Sc., EXAMINATION 2022
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) RFLP
 - b) RNase H
 - c) Dnase I
 - d) Cosmid
 - e) T – DNA
 - f) ZFN
 - g) Klenow
 - h) Genome
 - i) dNTP
 - j) Agarase
 - k) PCR
 - l) Vir E proteins
2. (a) What are shuttle vectors and explain the features that make them function as shuttle vectors? (1+4=5)
 - (b) Enumerate different enzymes with its functions that are used in Pyrosequencing. (5)
 - (c) Write short notes on SDS-PAGE. (3)
 - (d) 6 µg of protein is to be loaded on to SDS-PAGE with 6X loading buffer. Protein concentration of the solution is 0.25 µg/µL. Find out the amount of protein solution and the 6X loading buffer to be taken. (2)
3. (a) Write short notes on Northern Blotting.
 - (b) Describe a microarray platform for the comparison of human liver and stomach transcriptome where the expression of transcripts from both the tissues are compared using the same microarray slide.
 - (c) Describe any NGS platform where DNA polymerases or DNA ligases are not used. (5+5+5)
4. (a) Describe ChIP-on-chip with any suitable example.
 - (b) Using PCR, describe how levels of transcription of any one transcript in two different tissue samples of a same organism can be compared.
 - (c) Explain 2D-PAGE electrophoresis. (5+5+5)
5. (a) Explain possible scenario(s) how PCR based COVID detection methods could be failing in the event of emerging variants. (5)
 - (b) Briefly describe different steps in making an expression library. Discuss its merits over cDNA library. (8+2=10)
6. (a) Briefly describe how DIG labelled RNA probes could be made. How could these probes be detected that are bound to its target RNA in a tissue? (3+2=5)
 - (b) Briefly describe Sanger sequencing. (5)
 - (c) What is transduction? (1)
 - (d) What are the merits and demerits of viral mediated gene transfer in animal cells? (4)
7. (a) Discuss cDNA first strand synthesis using three different types of primers with its advantages and

disadvantages. (6)

- (b) A hypothetical transcript A has 5 exons each having a length of 500 bp. Splice variant 1 has all 5 exons and splice variant 2 has exons 1, 3 and 5. Splice variant 3 has four exons 1, 2, 4 and 5 whereas splice variant 4 has only two exons 1 and 5. In lungs splice variants 1 and 4 are expressed. In heart and kidney splice variants 2 and 3 are expressed respectively.

Answer the following questions based on the information given above.

- (i) Draw a schematic diagram depicting the above information. (1)
- (ii) Draw primer positions that can be used to amplify all the splice variants (using the same primer pair) and draw the electrophoretic pattern of the PCR products. (1+2=3)
- (iii) Design a strategy for Northern blotting to find out the given information experimentally. Substantiate your design strategy with adequate explanations. (5)