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Library
Department of Allied Health Sciences
Brainware University
Barasat, Kolkata- 700125

BRAINWARE UNIVERSITY

Term End Examination 2025-2026

Programme – M.Sc.(MB)-2025

Course Name – Genetic Engineering

Course Code - MMB27504A (T)

(Semester II)

Full Marks : 40

Time : 2:0 Hours

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)

1 x 10=10

1. Choose the correct alternative from the following :

- (i) The term 'endonuclease' refers to cutting the DNA sequence from
 - a) only within the polynucleotide chain, not at the ends
 - b) the ends of the chain
 - c) anywhere in the chain
 - d) exactly in the middle of the chain
- (ii) The restriction endonuclease is having a defence mechanism in the bacterial system against foreign DNA such as viruses. But how it is able to protect its own DNA?
 - a) By methylation of bacterial DNA by restriction enzyme
 - b) By methylation of foreign DNA by restriction enzyme
 - c) By phosphorylation of bacterial DNA by restriction enzyme
 - d) By phosphorylation of foreign DNA by restriction enzyme
- (iii) How many classes of restriction enzymes are there?
 - a) 2
 - b) 1
 - c) 3
 - d) 4
- (iv) Which of the following is a characteristic of Taq polymerase?
 - a) It is an RNA dependent RNA polymerase
 - b) It is an RNA dependent DNA polymerase
 - c) It is an DNA dependent DNA polymerase
 - d) It is an DNA dependent RNA polymerase
- (v) Why the whole lacZ gene can't be present in the plasmid at one time?
 - a) Because the whole lacZ gene can't be present anywhere
 - b) The whole lac Z gene is very large in size and the plasmid size is small
 - c) The whole lacZ gene is never functional
 - d) Because the plasmid takes is having a restriction site only for taking up a portion of the lacZ gene
- (vi) Hybridization of a labeled probe to target nucleic acid occurs through:
 - a) Ionic bonding
 - b) Disulfide bonding
 - c) Hydrogen bonding
 - d) Covalent bonding
- (vii) "Genomic DNA library" is a term used to describe:

- a) a computerized listing of known DNA sequences. b) bacteria with plasmids containing DNA fragments representing the majority of the genetic information from a plant or animal
- c) a collection of books about recombinant DNA technology d) a compilation of the amino acid sequences of protein-coding genes
- (viii) Which DNA repair pathway often leads to gene knockouts after CRISPR editing?
- a) HDR b) NHEJ
- c) BER d) NER
- (ix) Which strategy improves CRISPR precision in therapeutic applications?
- a) Longer gRNA b) High-fidelity Cas9 variants
- c) Increased Cas9 dosage d) Random mutagenesis
- (x) In Flavr Savr tomato, delayed softening occurs primarily due to:
- a) Increased starch synthesis b) Reduced cell wall degradation
- c) Blocked respiration d) Altered photosynthesis

Group-B

(Short Answer Type Questions)

3 x 5=15

2. List the essential structural features of plasmid cloning vectors. (3)
3. Illustrate how lambda vectors accommodate larger DNA inserts than plasmids (3)
4. Explain the role of probe chemistry in TaqMan-based qRT-PCR. (3)
5. Suppose in your laboratory you have only IMAC column for protein purification. Speculate what kind of tagged-vector will you use? (3)
6. Design a bacterial expression vector to minimize toxicity of a recombinant protein. (3)

OR

Design an affinity purification strategy for a recombinant protein expressed in E. coli. (3)

Group-C

(Long Answer Type Questions)

5 x 3=15

7. Explain in detail the various types of restriction enzymes. (5)
8. Summarize the different components used in PCR reaction and describe their role in detail (5)
9. A student researcher wants to check whether the gene of interest which she cloned in pET21 vector with c terminal His tag is expressing properly within the host or not. Explain the process which she should follow to know the result (5)

OR

Analyze why TaqMan probe-based qPCR assays are preferred over SYBR Green dye-based assays in the development of diagnostic kits, particularly with respect to specificity, multiplexing, and clinical reliability. (5)

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