18068

BRAINWARE UNIVERSITY

Term End Examination 2025-2026
Programme – M.Sc.(MB)-2024
Course Name – Recombinant DNA Technology
Course Code - MMB30113
(Semester III)

Full Marks : 60 **Time : 2:30 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 15=15

1. *Choose the correct alternative from the following :*

(i) Explain the role of restriction enzymes in cloning.
a) They join DNA ends
b) They methylate DNA
c) They cleave DNA at specific sequences
d) They degrade RNA

(ii) Describe the function of DNA ligase in molecular cloning.
a) Cuts DNA
b) Joins DNA fragments
c) Replicates DNA
d) Prevents replication

(iii) Interpret the purpose of using alkaline phosphatase during ligation.
a) To increase mutation
b) To remove phosphate groups
c) To amplify DNA
d) To degrade plasmids

(iv) Classify the types of cloning vectors based on their insert size capacity.
a) pUC19 < λ phage < BAC < YAC
b) YAC < BAC < plasmid
c) BAC < plasmid < phage
d) YAC < λ < Cosmid

(v) Illustrate how shuttle vectors function in different host systems.
a) They clone RNA
b) They replicate in one host only
c) They carry selectable markers
d) They function in prokaryotes and eukaryotes

(vi) Apply knowledge of vector design to select the best vector for plant transformation.
a) BAC
b) Cosmid
c) Ti plasmid
d) λ phage

(vii) Use the appropriate enzyme to prevent vector self-ligation.
a) Restriction enzyme
b) Ligase
c) Alkaline phosphatase
d) Kinase

(viii) Select the correct type of enzyme for generating sticky ends.
a) S1 nuclease
b) T4 DNA polymerase
c) EcoRI
d) DNase I

(ix) Demonstrate understanding by identifying the function of shuttle vectors.

a) Replicate in multiple hosts
b) Encode tRNAs
c) Express RNAi
d) Silence genes

(x) Choose the appropriate cloning system for a gene of 40 kb.

a) Plasmid
b) λ phage
c) YAC
d) pUC18

(xi) Evaluate the use of genomic vs cDNA libraries for eukaryotic gene isolation.

a) cDNA lacks introns, preferred for expression
b) Genomic contains protein sequences only
c) cDNA is unstable
d) Genomic is used in all cases

(xii) Justify the use of reverse transcriptase in cDNA synthesis.

a) Cuts RNA
b) Amplifies DNA
c) Converts mRNA to cDNA
d) Transfers plasmids

(xiii) Assess the limitations of direct selection for cloning genes.

a) Requires known phenotype
b) Only works with RNA
c) Ineffective in bacteria
d) Causes mutations

(xiv) Analyze the role of promoter in an expression vector.

a) Initiates DNA replication
b) Binds repressors
c) Initiates transcription
d) Cuts DNA

(xv) Distinguish between inducible and constitutive expression systems.

a) Inducible needs external signal; constitutive is always active
b) Both are inactive
c) Both express proteins permanently
d) Inducible uses promoters; constitutive does not

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Explain the role of restriction enzymes in gene cloning. (3)
3. Describe the function of alkaline phosphatase in plasmid cloning. (3)
4. Apply the use of terminal transferase in molecular cloning. (3)
5. Analyze the difference between inducible and constitutive expression systems. (3)
6. Critique the use of genomic libraries in prokaryotic expression. (3)

OR

Evaluate the advantages of linkers versus adaptors in cloning. (3)

Group-C

(Long Answer Type Questions) 5 x 6=30

7. Describe how real-time PCR differs from conventional PCR and its advantages. (5)
8. Evaluate the applications of different restriction enzymes in gene cloning experiments. (5)
9. Evaluate the importance of polylinker (MCS) in recombinant DNA design. (5)
10. Justify the selection of plasmid vectors over phage vectors for routine molecular cloning. (5)
11. Explain the characteristics and uses of different types of cloning vectors used in recombinant DNA technology. (5)
12. Analyze the advantages and limitations of different types of vectors used in recombinant DNA technology. (5)

OR

Analyze how features like origin of replication and selectable markers contribute to cloning vector efficiency. (5)

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