17242

BRAINWARE UNIVERSITY

Term End Examination 2025-2026
Programme – B.Sc.(BT)-Hons-2023
Course Name – Recombinant DNA Technology
Course Code - BBT50117
(Semester V)

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) Identify the enzymes present in bacteria which are responsible for restricting the growth of viruses?

a) Restriction endonuclease b) Gyrase
c) Lipase d) Exonuclease

(ii) Name the enzyme which is used to join together two different types of DNA molecules?

a) Ligase b) Nuclease
c) Protease d) Phosphatase

(iii) Polymerase chain reaction (PCR) was invented by

a) Watson b) Mullis
c) Crick d) Franklin

(iv) Taq polymerase is a---------- polymerase.

a) Heat stable b) Heat labile
c) Buffering d) Large

(v) Indicate the process by which DNA is directly introduced into animal cells.

a) Blotting b) Transfection
c) Conduction d) Conjugation

(vi) A plasmid can be considered as a suitable cloning vector if

a) It can be readily isolated from the cells b) It possesses a single restriction site for one or more restriction enzymes
c) Insertion of foreign DNA does not alter its replication properties d) All of these

(vii) The term 'endonuclease' refers to cutting the DNA sequence from

a) Anywhere 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

(viii) The restriction endonuclease acts as a defense 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 methylase enzyme
b) By methylation of foreign DNA by methylase enzyme
c) By phosphorylation of bacterial DNA by restriction enzyme
d) By phosphorylation of foreign DNA by restriction enzyme

(ix) Type II restriction enzymes cuts the sequence in the following way

a) Within the recognition sequence
b) At 100-1000 nucleotides away from the recognition sequence
c) At 27-30 nucleotides away from the recognition sequence
d) It cuts randomly

(x) Which of the following tools is used for checking primer specificity?

a) BLAST
b) UniProt
c) FASTA
d) UCSC Genome Browser

(xi) Which of these affects primer melting temperature (Tm)?

a) A-T ratio
b) Template purity
c) Primer length and GC content
d) Electrophoresis voltage

(xii) Reverse transcription in RT-PCR converts:

a) DNA to RNA
b) Protein to RNA
c) RNA to cDNA
d) mRNA to protein

(xiii) RT-PCR is preferred in viral detection because of its:

a) Accuracy
b) Speed
c) RNA targeting ability
d) DNA editing efficiency

(xiv) What challenge arises with high GC content in primers?

a) Low Tm
b) Reduced amplification
c) Primer-dimer formation
d) Misfolding of DNA

(xv) Which step is crucial to validate RT-PCR results?

a) No-template control
b) Colorimetric staining
c) Probe denaturation
d) DNA ligase digestion

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Describe the role of a YAC (Yeast Artificial Chromosome) in gene cloning. (3)
3. How can you check the specificity of your PCR product? (3)
4. Explain the process of electroporation. (3)
5. You have a circular DNA molecule of 8 kb in length. Three different restriction enzymes, A, B, and C, cut the DNA at the following positions: A-B = 2 kb, B-C = 3 kb, and C-A = 1 kb. What is the order of the restriction sites on the circular DNA? (3)
6. A biotechnology company wants to confirm the successful integration of a transgene in a genetically modified plant line. PCR indicates the presence of the transgene, but they need to determine the copy number and confirm genomic integration. Which method should they use? (3)

OR

Explain the role of vir genes in Agrobacterium mediated gene transfer. (3)

Group-C

(Long Answer Type Questions) 5 x 6=30

7. Debate whether random mutagenesis or rational design is better for generating enzymes with enhanced catalytic activity. (5)
8. Discuss the three major methods used for producing transgenic mice, highlighting their advantages and limitations. (5)

9. State the principle of action of the enzyme ligase. (5)
10. Explain the difference between PCR and qPCR. What are the advantages of qPCR? (5)
11. Compile the characteristics of different types of vectors with examples. (5)
12. Infer how the development of transgenic mice has advanced the understanding of human diseases. (5)

OR

Analyze the role of embryonic stem (ES) cells in gene targeting experiments in mice. (5)

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