KAMARAJ COLLEGE (Autonomous)

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(Affiliated to Manonmaniam Sundaranar University, Tirunelveli)

(3 Pages) **Reg. No:……**

Question Code: 26E01513 **Course Code : 24UEMB41**

UG Degree - End Semester Examinations, April 2026

Fourth Semester

B.Sc., MICROBIOLOGY

Genetic Engineering

(For those who joined in July 2024 onwards)

Time : 3Hours **Maximum : 75 Marks**

PART – A (10 × 1 = 10 Marks)

Answer ALL Questions

Choose the correct answer :

CO:2 K:1 1. Restriction enzymes were first discovered in:

(a) Plants (b) Bacteria

(c) Animals (d) Viruses

CO:1 K:2 2. The first recombinant DNA experiment was carried out by:

(a) Paul Berg (b) Frederick Sanger

(c) Watson and Crick (d) Gregor Mendel

CO:2 K:1 3. Which restriction enzyme produces blunt ends?

(a) *EcoRI* (b) *BamHI*

(c) *SmaI* (d) *HindIII*

CO:2 K:2 4. *HaeIII* recognizes which sequence?

(a) GAATTC (b) AAGCTT

(c) CCCGGG (d) GGCC

CO:3 K:2 5. In λ phage replacement vectors, the foreign DNA replaces:

(a) Essential genes (b) Capsid protein genes

(c) Non-essential central region (d) Promoter region

CO:3 K: 2 6. pUC18 differs from pBR322 mainly by having:

(a) Lower copy number (b) A multiple cloning site

(c) No origin of replication (d) No selectable marker

CO:4 K:1 7. The label commonly used in non-radioactive molecular probes is

(a) Biotin or digoxigenin (b) ^{32}P

(c) Sulphur-35 (d) Tritium

CO:4 K:2 8. Which blotting technique helps in studying gene expression?

(a) Southern blot (b) Northern blot

(c) Western blot (d) Dot blot

CO:5 K:1 9. Reverse transcription PCR (RT-PCR) is used for amplification of

(a) Protein (b) Lipid

(c) Carbohydrate (d) RNA

CO:5 K:2 10. VNTRs and STRs used in DNA fingerprinting are examples of:

(a) Coding DNA (b) Non-repetitive DNA

(c) Viral DNA (d) Repetitive DNA

PART – B (5 X 5 = 25 Marks)

Answer ALL Questions choosing either (a) or (b).

Answer should not exceed 250 words.

CO:1 K:2 11. (a) Explain the historical development of genetic engineering

(OR)

(b) Illustrate the basic steps involved in recombinant DNA technology.

CO:2 K:5 12. (a) Explain the properties and types of restriction enzymes

(OR)

(b) Describe the applications of nucleases and topoisomerases in molecular biology.

CO:3 K:2 13. (a) Describe the structural features and applications of natural plasmid vectors such as pSC101, pSF2124 and pMB1

(OR)

(b) Illustrate the construction of recombinant DNA using plasmid-based vectors

CO:4 K: 4 14. (a) Differentiate between Southern, Northern and Western blotting techniques

(OR)

(b) Analyze the role of molecular probes in genetic engineering

CO:5 K:2 15. (a) Explain the components required for PCR amplification

(OR)

(b) Describe the principle and procedure of DNA fingerprinting.

PART – C (5 X 8 = 40 Marks)

Answer ALL Questions choosing either (a) or (b).

Answer should not exceed 500 words.

CO:1 K:5 16. (a) Assess the scope of genetic engineering in three different fields.

(OR)

(b) Evaluate the advantages and limitations of genetic engineering.

CO:2 K:4 17. (a) Discuss the prominent enzymes used in genetic engineering, highlighting their roles and significance.

(OR)

(b) Analyze the importance of recognition sequences and utilities in genetic engineering.

CO:3 K: 5 18. (a) Justify the use of hybrid vectors such as cosmids in molecular cloning experiments.

(OR)

(b) Interpret a schematic representation showing the construction of a recombinant λ phage replacement vector.

CO:4 K:5 19. (a) Explain the construction of chimeric DNA using restriction enzymes and DNA ligase.

(OR)

(b) Describe the steps involved in cloning of a gene in bacteria.

CO:5 K:5 20. (a) Evaluate the advantages and limitations of PCR technique. Highlight the modifications in PCR.

(OR)

(b) Justify DNA fingerprinting.