

KAMARAJ COLLEGE (Autonomous)

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(Affiliated to Manonmaniam Sundaranar University, Tirunelveli)

THOOTHUKUDI – 628 003

(6 Pages)

Reg. No:

Question Code No : 25003503

Course Code : 24PMB033

PG Degree - End Semester Examinations, November 2025

Third Semester

M.Sc. BOTANY

Recombinant DNA Technology and Industrial Applications

(For those who joined in July 2024 onwards)

Time: 3 Hours

Maximum: 75 Marks

PART – A (10 × 1 = 10 Marks)

Answer ALL Questions

Choose the correct answer:

1. Find the type of vector most suitable for cloning large DNA fragments.
(a) Plasmid (b) Cosmid
(c) Bacteriophage lambda (d) Yeast artificial chromosome

2. Which of the following is a common indirect method of gene transfer in plants?
- (a) Microinjection
 - (b) Agrobacterium-mediated transformation
 - (c) Electroporation
 - (d) Liposome-mediated transfer
3. Show which blotting technique transfers DNA from a gel to a membrane for hybridization.
- (a) Northern blot
 - (b) Western blot
 - (c) Southern blot
 - (d) Eastern blot
4. Find the process that silences specific gene expression using double-stranded RNA.
- (a) Genome editing
 - (b) cDNA synthesis
 - (c) Transformation
 - (d) RNA interference (RNAi)
5. Define the role of *Gluconobacter oxydans* in Vitamin-C production.
- (a) Production of glucose oxidase
 - (b) Conversion of sorbitol to sorbose
 - (c) Breakdown of ethanol
 - (d) Synthesis of riboflavin

6. Name the enzyme that breaks down DNA and is used clinically for cystic fibrosis therapy.

- (a) β -Glucocerebrosidase (b) DNA polymerase
(c) L-Asparaginase (d) Human

Deoxyribonuclease I

7. Outline the therapeutic use of erythropoietin.

- (a) Diabetes mellitus
(b) Hepatitis B prevention
(c) Treatment of anemia due to chronic kidney disease or chemotherapy
(d) Hairy cell leukemia

8. The method by which interferons commonly produced at industrial scale.

- (a) Culturing viruses in embryonated eggs
(b) Isolation from human plasma
(c) Recombinant DNA technology using *E. coli* or mammalian cells
(d) Extraction from plant tissues

9. Find the recombinant microbial source used for large-scale vitamin B₁₂ production.

- (a) *Rhizobium radiobacter*
(b) *Paracoccus denitrificans*

(c) *Aspergillus niger*

(d) *Saccharomyces cerevisiae*

10. Select the recombinant enzyme that used in dairy industry for low-lactose milk.

(a) Protease

(b) Lactase

(c) Amylase

(d) Lipase

PART - B (5 X 5 = 25 Marks)

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

Answer should not exceed 250 words.

11. (a) Build a flowchart showing the common steps involved in the production of cloned gene products from GMO.

(OR)

(b) Develop a strategy for detecting recombinants using reporter genes.

12. (a) Identify the essential steps in preparing competent *E. coli* cells for transformation.

(OR)

(b) Organize the different types of blotting techniques.

13. (a) Compare Vitamin C production by yeasts versus *Gluconobacter oxydans* bacteria.

(OR)

(b) Distinguish between penicillin and tetracycline production in terms of microbial origin.

14. (a) List the uses of recombinant erythropoietin in medicine.

(OR)

(b) Analyze the production of recombinant insulin and its medical importance.

15. (a) Inspect the role of recombinant technology in enhancing silk production in sericulture.

(OR)

(b) Explain the relationship between rDNA technology and improved productivity in animal husbandry.

PART - C (5 X 8 = 40 Marks)

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

Answer should not exceed 600 words.

16. (a) Compare direct gene transfer and indirect gene transfer methods with examples.

(OR)

(b) Judge the efficiency of different types of vectors used in recombinant DNA experiments.

17. (a) Determine the steps involved in constructing a genome library.

(OR)

(b) Discuss the influence of CRISPR-Cas9 technology on genetic research and therapy.

18. (a) Explain the production process of L-Asparaginase.

(OR)

(b) Discuss the steps involved in the microbial production of β -Glucocerebrosidase.

19. (a) Compose a detailed protocol for the recombinant production of Interferon-Beta-1b.

(OR)

(b) Compile the steps involved in producing of Hepatitis B vaccine by recombinant DNA technology.

20. (a) Elaborate on the steps involved in the production of Vitamin B₁₂ using recombinant bacteria *Paracoccus denitrificans*.

(OR)

(b) Design a large-scale fermentation setup for the production of fungal α -amylase.