(6 pages) Reg. No. : .....

Code No. : 30720 E **Sub. Code : EMMI 31**

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2025.

Third Semester

Microbiology – Main

MOLECULAR BIOLOGY AND MICROBIAL GENETICS

(For those who joined in July 2023 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. The structure of RNA differs from that of DNA, as RNA contains ————————.
   (a) The sugar ribose instead of deoxyribose
   (b) Uracil instead of thymine
   (c) It contain Cytosine
   (d) Both (a) and (b)

2. Replication of a bacterial chromosome normally starts at a fixed point called ————————.
   (a) Replication fork (b) Recognition site
   (c) Ori V (d) ter

3. In prokaryotes, the enzyme ———————— transcribes a gene from the promoter.
   (a) DNA polymerase (b) Primase
   (c) RNA polymerase (d) DNA ligase

4. The trp operon encodes ———————— structural genes involved in tryptophan biosynthesis.
   (a) Three (b) Five
   (c) Six (d) Four

5. Identify the following is also known as the removal of one or more bases from the nucleotide chain.
   (a) Deletion (b) Insertion
   (c) Transition (d) Transversion

6. Select the following mechanisms will remove uracil and incorporate the correct base.
   (a) Direct repair
   (b) Base excision repair
   (c) Mismatch repair
   (d) Nucleotide excision repair

7. ———— characteristics do F-plasmids confer to the host bacterium.

(a) Antibiotic resistance

(b) Fluorescent colonies

(c) Conjugative ability

(d) Virulence

8. The capsid (protective coat) of the bacteriophage made up of ————.

(a) DNA (b) RNA

(c) Protein (d) Organic acids

9. Introduction of DNA molecules into the recipient organism is termed as ————.

(a) Transformation (b) Translation

(c) Transduction (d) Transcription

10. The enzyme that catalyzes the transposition of an IS element is called ————.

(a) Transposase (b) Integrase

(c) Transcriptase (d) Polymerase

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) Describe the different forms of DNA.

Or

(b) List the salient features of DNA denaturation and renaturation process.

12. (a) Interpret the mechanism of gene regulation in trp operon.

Or

(b) Differentiate between prokaryotic and eukaryotic translation.

13. (a) Examine the phenotypic effect of conditional lethal mutations.

Or

(b) Explain the SOS repair mechanism.

14. (a) Illustrate the rolling circle mechanisms of plasmid replication.

Or

(b) Select the application of phages in microbial genetics.

15. (a) Appraise the steps involved in natural transformation process.

Or

(b) Predict the different types of prokaryotic transposons.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b)
Each answer should not exceed 600 words.

16. (a) Describe the structural characteristics of DNA double helix.

Or

(b) Examine the enzymology of DNA replication.

17. (a) Explain the steps involved in process of transcription in prokaryotes.

Or

(b) Discuss the process of regulation of gene expression in Lac operon.

18. (a) Interpret the different types of mutation.

Or

(b) Illustrate the mechanisms and function of DNA mismatch repair.

19. (a) Analyze the process of plasmid DNA replication and amplification.

Or

(b) Illustrate the steps involved in lytic life cycle of T4 bacteriophage.

20. (a) Assess the process of bacterial conjugation and its advantages.

Or

(b) Summarize the mechanism of generalized transduction process.

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