

B.Sc. Semester - 5 (Remedial) (NEP-2020) Examination**March/April-2026****BIT: Genetics and Molecular Biology (Major-12)****Time: 2:00 Hours****Marks:50****Instructions:**

1. All questions are compulsory.
2. Figures to the right indicate marks.

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- Que.1 (1) State Mendel's three laws of inheritance and give one example for each. (05)
(2) Define the gene concept and explain the difference between units of genetic structure and units of genetic function. (05)
- OR
- (1) Briefly describe the semiconservative model of DNA replication (05)
(2) Describe the gene-cistron relationship in prokaryotes and eukaryotes. (05)
- Que.2 (1) Briefly explain the process of transcription in prokaryotes. (05)
(2) Briefly describe any two post-transcriptional control mechanisms in gene expression. (05)
- OR
- (1) Describe the structure of the ribosome and explain its role in translation. (05)
(2) Write a short note on the post-translational modifications of proteins, giving two examples. (05)
- Que.3 (1) Explain the steps involved in natural transformation in bacteria, highlighting the role of competence. (05)
(2) Compare generalized and specialized transduction with suitable examples. (05)
- OR
- (1) Describe the conjugation process in Gram-negative bacteria using the F plasmid as an example. (05)
(2) What are transposable genetic elements? Give one example each of insertion sequences and transposons. (05)
- Que.4 (1) Briefly explain the steps involved in isolation of DNA from prokaryotic cells. (05)
(2) Compare the features of pBR322 and pUC vectors. (05)
- OR
- (1) Write a short note on advanced cloning vectors BACs and YACs. (05)
(2) Explain how colony hybridization is used to detect recombinant molecules. (05)
- Que.5 (1) Explain why DNA is considered the universal genetic material, citing experimental evidence. (05)
(2) Explain the lac operon model for lactose utilization in *E. coli*, highlighting the role of the repressor protein. (05)
- OR
- (1) Describe artificially induced competence and mention two methods to achieve it. (05)
(2) Define site-directed mutagenesis and explain one commonly used method to perform it. (05)
