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Total Pages : 3

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May-2026

B.Sc. Life Sciences-IVth SEMESTER

BOTANY IV CELL AND MOLECULAR BIOLOGY

(BLS-401)

Time: 3 Hours]

[Max. Marks : 75

Instructions :

1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*
2. *Answer any four questions from Part-B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART-A

1. (a) What does the Central Dogma explain? (1.5)

   (b) What is the difference between a nucleoside and a nucleotide? (1.5)

   (c) What is the principle of Light Microscopy? (1.5)

   (d) What are lysosomes? Why are they called "suicide bags"? (1.5)

   (e) What is facilitated diffusion? (1.5)

(f) List key features of the genetic code. (1.5)

(g) What is an operon? (1.5)

(h) What does the endosymbiotic theory state? (1.5)

(i) Give three key differences between mitosis and meiosis. (1.5)

(j) What is a peroxisome? (1.5)

PART–B

2. (a) Explain the mechanism of DNA replication in prokaryotes with the role of enzymes. (10)

   (b) Explain how the structure of the Nuclear Pore Complex regulates nucleocytoplasmic transport. (5)

3. (a) Explain the Fluid Mosaic Model and analyze how it accounts for membrane flexibility and transport. (5)

   (b) Describe Griffith's Experiment and Hershey-Chase Experiment. How did they prove that DNA is the genetic material? (10)

4. Describe the mechanism of translation in prokaryotes, including all major steps, Illustrated with a well-labelled diagram. (15)

5. (a) Compare prokaryotic and eukaryotic cells in terms of structural organization with the help of suitable diagrams. (5)

   (b) What is RNA splicing? Describe the steps involved in splicing and name the components of the spliceosome. (10)

6. (a) A biologist is studying :

   (a) Internal structure of mitochondria.

   (b) Surface morphology of bacteria.

   (c) Live cell dynamics.

   Analyze and justify the most appropriate microscopy technique (Light, SEM, TEM) for each case, including advantages and limitations. (10)

   (b) Write a short note on the semiautonomous nature of mitochondria and chloroplasts. (5)

7. Compare the structure and functions of microfilaments, microtubules, and intermediate filaments. How does each of these cytoskeletal components help the cell maintain its shape and resist mechanical stress? Explain with suitable examples. (15)