

B.STAT. SECOND YEAR: 2025-26

MID SEMESTER EXAMINATION

Subject – Molecular Biology

Date of Examination – 12.09.2025

Total marks: 30

Time: 2 hours

Q1. Tick the right answer (1×5)

- a) Which chemical agent denatures DNA at neutral pH
1. Urea
 2. Formamide
 3. Both
 4. None of the above
- b) The point of attachment of a Purine base with the deoxyribose sugar is
1. N-1
 2. N-9
 3. N-7
 4. N-3
- c) The size of a typical linker DNA is
1. 55bp
 2. 46bp
 3. 54bp
 4. 50bp
- d) Enzyme α -amylase is sensitive to
1. temperature
 2. pH
 3. light
 4. None of the above
- e) Which type of rRNA sequencing is commonly used to identify bacteria?
1. 16S rRNA
 2. 18S rRNA
 3. 28S rRNA
 4. 8S rRNA

Q2. Complete the following biochemical reactions by providing the structures of reactants and products, the enzymes involved, and any other necessary substances (e.g., cofactors, coenzymes): (1×5)

- Conversion of glucose to glucose-6-phosphate
- Isomerization of 3-phosphoglyceric acid to 2-phosphoglyceric acid
- Cleavage of fructose 1,6-bisphosphate
- Transformation of galactose into glucose
- Formation of pyruvic acid from 2-phosphoenolpyruvate

Q3. Write answer in one sentence only (1×5)

- What is the composition of nucleosome octamer core?
- What is the function of Proliferating Cell Nuclear Antigen (PCNA)?
- What does it suggest if the DNA purity has a A_{260}/A_{280} ratio equal to 2?
- Which plasmid acts as a weapon in the bacterial world?
- Why is the lysosomal membrane resistant to its own hydrolytic enzymes?

Q4. Short answer question (2×5)

- Define the function of the following subunits of *E. Coli* RNA polymerase

Name of the subunit	Function
α	
β	
β'	
σ	

- What is leading and lagging strand of DNA replication?
- Write 4 differences between DNA and RNA.
- What are the components of the cytoskeleton, in which types of cells is it present, and what is its function?
- Define facultative aerobes and facultative anaerobes.

Q5. Answer the following questions (2.5 × 2)

- Draw and briefly describe the formation of transcription bubble.
- Illustrate, label, and briefly explain the "powerhouse" of the cell.

[Open notes will not be allowed]