

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION-2025

MSc-I Semester (BT)

Course Code(Credits): 20MS1BT112 (3)

Max. Marks: 25

Course Name: Cell and Molecular Biology

Course Instructors:Dr. Abhishek Chaudhary

Max. Time: 1.5 Hour

Note: All questions are compulsory. Marks are indicated against each question in square brackets.

Q.No	Question	Marks
Q1	DNA supercoiling is the over- or under-winding of a DNA double helix upon itself, a structural change that alters the molecule's topology by changing its linking number - What is the linking number (Lk)? Calculate the Lk, for a relaxed, closed-circular B- DNA with 4830 base pairs? Enter your answer as an integer. - What is Lk for negatively supercoiled 4830 bp DNA if it is underwound by 3 complete turns? - How does Lk change when there is a break in one strand? - How do topoisomerases 1 and 2 affect DNA supercoiling?	3+2+1+2
Q2	Answer the following question based on DNA replication mechanism - If DNA synthesis always proceeds in the 5-3 direction, how can both strands be synthesized simultaneously?[2] - What do you think about processivity of DNA polymerase? how processivity affect DNA replication.[2] - Some time nitrogen bases can spontaneously rearrange into less common tautomeric forms (enol for G/T and keto for A/C). For instance, an enol-guanine can pair with a keto-thymine, and an imino-adenine can pair with a keto-cytosine. How this error corrected by DNA replication machinery? Explain with neat and clean diagram. [3] - Describe klenow fragment and the activities you anticipate within it. Do you think that the klenow fragment plays a significant part in the packaging and supercoiling of DNA? If so, describe.[2]	2+2+3+2
Q3	There are different subcompartments in mitochondria the internal matrix space and the intermembrane space, which is continuous with the cristae space. Proteins imported into mitochondria are usually taken up from the cytosol within seconds or minutes of their release from ribosomes. Provide a clear and concise picture to demonstrate the process of protein transport from the cytosol to the mitochondria.	5
Q4	Answer the following question based on chromosome structure - Significance of A=T rich sequence in centromear - What is the role of histones and the nucleosome in the compaction of the chromatin?	3