

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2024

B.Tech-IV Semester (BI)

COURSE CODE(CREDITS): 18B11BI413 (3)

MAX. MARKS: 35

COURSE NAME: Structural Biology

COURSE INSTRUCTORS: Dr. Raj Kumar, Dr. Poonam Sharma.

MAX. TIME: 2 Hours

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**Note: (a)** All questions are compulsory.

**(b)** Marks are indicated against each question in square brackets.

**(c)** The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

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- Q1 (a). Explain the principle of XRD? (CO-2,3) [2]  
(b). Elaborate the difference between TEM and SEM. (CO-2,3) [3]
- Q2 (a). Describe Lambert-Beer's Law. (CO-2,3) [3]  
(b). Elucidate different types of absorption and emission pathways for UV spectroscopy (CO-2,3) [3]
- Q3. Give a brief account on how water molecules may facilitate protein oligomerization. (CO-3,4) [2]
- Q4. DNA and RNA are the two main types of nucleic acids. Explain one key chemical difference between the sugar components of DNA and RNA. (CO-5) [3]
- Q5. A paradox is a logically self-contradictory statement or a statement that runs contrary to one's expectation? Discuss a paradox situation with one example in context to protein folding. (CO-3,4) [3]
- Q6. Investigate the impact of chemical compounds such as urea and  $\beta$ -mercaptoethanol on protein folding and stability, explaining their mechanism of action. (CO-3,4) [3]
- Q7. The specific sequence of nitrogenous bases in a nucleic acid is crucial for its function. Explain the concept of complementary base pairing and how it plays a role in DNA structure and function. (CO-5) [3]

Q8. Describe the structural changes that occur in hemoglobin molecules in individuals with sickle cell anemia, and how these changes lead to the characteristic sickle shape of red blood cells. (CO-4) [5]

Q9. Protein folding is typically regarded as a spontaneous process. According to the second law of thermodynamics, for spontaneous processes, the overall entropy of the system and its surroundings should tend to increase. However, in the process of protein folding, it is observed that entropy decreases. Justify why this seemingly contradictory phenomenon occurs. (CO-3,4) [5]