JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2023

B.Tech-IV Semester (BI)

COURSE CODE(CREDITS): 18B11BI413 (3) MAX. MARKS: 35

COURSE NAME: Structural Biology

COURSE INSTRUCTORS: Dr. Raj Kumar MAX. TIME: 2 Hours

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

Q1. Answer the following questions in context to macromolecular structure determination:(CO-2)

a) Bragg's diffraction occurs when a subatomic particle or electromagnetic radiation waves have wavelengths that are comparable to atomic spacing in a crystal lattice. What is Bragg's equation and how it can be used to study protein structure? [3]

b) X-ray crystallography and electron microscopy are major techniques used for macromolecular structure determination. Discuss their application in structure determination with respect to their wavelengths. [3]

c) Circular Dichroism uses circularly polarized light to investigate structural aspects of optically active chiral biological molecules. What is the difference between an unpolarized and polarized light? How will you obtain circular polarized light? [2]

Q2. Brief answer in context to nucleic acids structure: (CO-5)

a) Purines and pyrimidines are the building blocks of the nucleic acids. Describe the major structural differences between them. [3]

b) There are three possible conformations of DNA. Discuss the role of sugar puckering in these conformations. [3]

c) By taking an example of the nitrogenous base Adenine in DNA, discuss structural aspects of its nucleotide. [2]

d) Discuss the importance of 5' and 3' ends of a mRNA molecule. [2]

Q3. For the protein folding problem, briefly explain: (CO-4)

a) the protein folding paradox with help of an example. [3]
b) the relationship between energy and entropy in a protein folding funnel diagram. [3]

Q4. If a DNA sample contains 30 Adenine residues. Figure out the amount of cytosine if the sample is made up of 200 residues. (CO-5) [3]

Q5. Several genetic diseases are associated with quaternary structures of proteins. Justify with help of a classical example. (CO-4) [3]

Q6. Anfinsen's hypothesis stated that protein structure prediction depends solely on amino acid sequence. Discuss the role of important chemicals used in the experiment at different steps?

(CO-3) [5]