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21BT53

Fifth Semester B.E. Degree Examination, Dec.2023/Jan.2024 Structural Biology and Analytical Techniques

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Illustrate the conformational analysis and forces that determine the protein structure. (10 Marks)
b. Define secondary structure of a protein. Explain the structural aspects of β -sheets and β -turns in detail. (10 Marks)

OR

- 2 a. Explain Ramachandran map in detail and add a note on its significance. (10 Marks)
b. Discuss the thermodynamic aspect of protein folding. (10 Marks)

Module-2

- 3 a. Discuss the structural variations in A, B and Z forms of DNA. (10 Marks)
b. Write a brief note on:
i) Ribose puckering ii) Tertiary structure of tRNA. (10 Marks)

OR

- 4 a. Explain the structural and conformational features of cell membrane using Singer-Nicholson model. (10 Marks)
b. Define integral proteins. Illustrate the conformational variations of integral proteins during ion transport. (10 Marks)

Module-3

- 5 a. Explain with suitable theory, how Rayleigh Scattering is useful as biophysical technique for elucidation of size and shape of molecule. (10 Marks)
b. Explain the principle and technique of MALDI-TOF spectroscopy. (10 Marks)

OR

- 6 a. With a neat labeled diagram, explain the principle, working and applications of Scanning Electron Microscope (SEM). (10 Marks)
b. Write short notes on:
i) Patch clamp technique
ii) Phosphorescence. (10 Marks)

Module-4

- 7 a. Elaborate on principle instrumentation of ultracentrifugation. Discuss the advantages of their technique. (10 Marks)
b. Explain in detail the principle, instrumental factors and steps involved in single crystal X-ray diffraction technique to determine the structure of biomolecule. (10 Marks)

OR

- 8 a. Give a concise account on NMR spectroscopy highlighting its applications. (10 Marks)
b. Explain the principle instrumentation and application of uv spectroscopy. (10 Marks)

Module-5

- 9 a. Explain the principle, instrumentation and applications of isoelectrofocussing. (10 Marks)
b. With a schematic representation, explain the principle, working mode and applications of ion exchange chromatography. (10 Marks)

OR

- 10 a. Discuss the principle, instrumentation and applications of gas chromatography. (10 Marks)
b. Discuss the following terms used in chromatography:
i) Stationary phase
ii) Mobile phase
iii) Chromatogram
iv) Retention factor
v) Column efficiency. (10 Marks)

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