



Name :

Roll No. :

Invigilator's Signature :

CS/M.Tech (BT-BACK LOG)/SEM-2/MBT-202/2010

2010

SPECTROSCOPY, CRYSTALLOGRAPHY, INSTRUMENTATION & MICROSCOPY

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

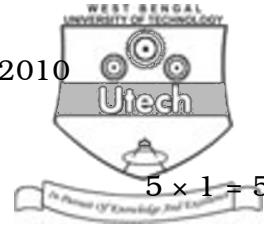
Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

1. Answer any *five* of the following : 5 × 1 = 5
- i) The scattering of x-rays from a crystal is primarily caused due to
 - a) Electrons
 - b) Protons
 - c) Neutrons
 - d) The nucleus.
 - ii) Name one water soluble compound that can be used as an 'internal NMR reference'.
 - iii) What will happen in λ_{\max} when the pH of a Tyr solution is changed from 7.0 to 9.1 ?
 - iv) The Fourier transform of the electron density function is the
 - a) Spherical wave function
 - b) Plane wave function
 - c) Structure factor
 - d) Cell volume



3. What do you understand the term resolution in the context of an experiment in x-ray crystallography ? Write down the steps in typical x-ray crystallography experiment from data collection in obtaining the coordinates of the molecule. 10
4. a) What is fluorescence quantum yield ? Arrange in increasing order of fluorescence quantum yield for Phe, Trp, His and Tyr with proper reason.
- b) A short helical peptide is treated with varying concentration of GnCl to study the unfolding process. Using CD, NMR and fluorescence spectroscopy how do you monitor this 'helix-coil transition' ? 3 + 7
5. a) What is Cotton effect ? How do you obtain positive Cotton effect ?
- b) Explain with mechanism the phenomenon of 'FRET'. Give an example of FRET in living biological system.
- c) On excitation at 285 nm, under ordinary condition BSA shows fluorescence at 347 nm. When tagged with ANS, excitation at same wavelength shows fluorescence at 467 nm, which is characteristic for ANS itself, with little reduced intensity. Characterize the statement with proper reason. 3 + 4 + 3



GROUP – B

Answer any *five* of the following.

6. Who invented electron microscope ?
7. What is the illumination source in an Electron Microscope ?
8. What is the resolving power of an Electron Microscope ?
9. What is the meant by resolving power ?
10. What kind of lenses are used in an Electronic Microscope ?
11. Which instrument is used to analyze microbial cell surface ?
12. Which instrument is commonly used for measurement of bacterial growth curve ?

Answer any *two* of the following :

$2 \times 15 = 30$

- 13 Differentiate between an electron microscope and an optical microscope.
14. Mention the working principle of any three commonly used instruments in a microbiology laboratory.
15. What are the similarities and differences between scanning electron microscope and a transmission electron microscope ?

