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SEAT No. _____

No. of Printed Pages : 2

SARDAR PATEL UNIVERSITY

M.Sc. (Physics)(IVth Semester) Examination

Date : 23/03/2019, Day : Saturday, Time : 10:00a.m. to 1:00 p.m.

Subject : Applied Crystallography and BioPhysics, Paper No. PS04EPHY01

CBCS(choice based credit system)

Important Note : Q.1 : Multiple choice questions (MCQ) carries one mark each.

Q.2 : Short questions carries two marks each (attempt any seven out of nine)

Q.3 to Q.6 : Long questions carries 12 marks .

Total Marks : 70

Q.1 Choose the appropriate options from the following in Q.1 (8)

- 1 Which type of X-ray radiation is used in Laue method ?
(a) characteristic (b) continuous (c) soft (d) none of these
- 2 In Debye Scherrer method ,the crystal is always
(a)amorphous (b)polycrystalline (c) single crystal (d) liquid crystal
- 3 In intensity equation, the factor which defines the number of different planes in a form having the same spacing is called as
(a)multiplicity (b) Lorentz (c) absorption (d) polarization
- 4 The equation used to determine the particle size is known as
(a) Rayleigh (b) Bragg's (c) Scherrer's (d) Compton
- 5 Raman spectra of nucleic acid are obtained from the bases and the sugar-phosphate backbone. The phosphate group has two types of which of the following symmetric stretching modes ?
(a) P-O (b) P-H (c) P-C (d) P-N
- 6 When two cysteine molecules combine together, which type of bonding is formed
(a) hydrogen (b) disulphide (c) peptide (d) ionic
- 7 For crystallizing proteins in aqueous solution which of the following can be used as additives
(a)alcohol (b) polyethylene glycol (c) ammonium sulphate (d) salts
- 8 Myoglobin molecule possess which type of atoms at corners of heme plane
(a) oxygen (b) nitrogen (c) phosphorus (d) carbon

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(P.T.O.)

- Q.2 Answer any seven questions out of nine in Q.2 (14)**
- 1 How rotation method differs from Weissenberg method ?
 - 2 Why polycrystalline sample cannot be studied by Laue method ?
 - 3 Derive the equation used to determine the particle size of crystallites.
 - 4 How multiplicity factor affects the intensity of powder diffracted line ?
 - 5 What is Wilson plot ?
 - 6 Which three measurable parameters are commonly used for obtaining image of tissues in MRI ?
 - 7 What do you understand by violation of Friedel's law ?
 - 8 Discuss Pullman's criteria for carcinogenic activity .
 - 9 How Raman Spectroscopy can be used to probe the structure of proteins and nucleic acids ?

Q.3(a) Explain oscillation method used to determine the lattice parameter of a single crystal specimen. (6)

Q.3(b) Describe Debye Scherrer method with proper diagrams and explain how it can lead to the lattice parameter determination of a powder specimen. (6)

OR

Q.3(b) Discuss Laue method with forward and backward geometry used to index different diffracted planes. (6)

Q.4(a) Discuss X-ray diffraction under non-ideal condition. (6)

Q.4(b) Describe absorption and Lorentz polarization factor which affects the intensity of diffraction line of a powder pattern. (6)

OR

Q.4(b) How one can determine the particle size of very small crystals from the measured width of diffraction curves ? Explain with deriving appropriate equations. (6)

Q.5(a) Explain how primary, secondary and tertiary structure of DNA is formed. (6)

Q.5(b) Describe with schematic diagram the working of single crystal X-ray diffractometer used to determine the crystal structure. (6)

OR

Q.5(b) Explain its primary, secondary and tertiary structure of proteins. (6)

Q.6(a) Discuss delocalization in biomolecules specifically considering example of benzene molecule and explain various parameters which can be obtained applying tight binding model to it. (6)

Q.6(b) Explain how fluorescence spectroscopy can provide information about molecular conformation and dynamics of biological molecules. (6)

OR

Q.6(b) State the basic principle of Infrared spectroscopy and discuss how proteins can be studied with the help of this technique. (6)