(183 & A-32) SEAT No._____ **No. of Printed Pages : 2**

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SARDAR PATEL UNIVERSITY

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

Date : 27/10/2018, Day : Saturday, Time : 2:00 p.m. to 5:00 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 In Precession method the specimen is
(a) polycrystalline (b) single crystal (c) amorphous (d) liquid

2 In Rotation method which type of radiation is used
(a)monochromatic X-rays (b)polychromatic X-rays (c) electron beam (d) ion beam

3 Which factor is independent of θ and do not enter into the calculation of relative intensities
(a)multiplicity (b) temperature (c) absorption (d) Lorentz-polarization

4 Analytical methods of indexing patterns of non-cubic crystals involve arithmetical manipulation of the observed --------- values .
(a) $\sin^2\theta$ (b) $\cos^2\theta$ (c) $\cot^2\theta$ (d) $\tan^2\theta$

5 During double strand formation of DNA, the guanine of the first chain pairs with ------ of the second chain
(a) cytosine (b) thymine (c) adenine (d) guanine

6 Keratin which is fibrous protein is an example of
(a) α- helix (b) β- sheet (c) ϒ-helix (d) δ-helix

7 Which of the following is used as a catalyst for a biochemical reaction to occur ?
(a) Proteins (b) Nucleic acids (c) Enzymes (d) viruses

8 Hemoglobin molecule possess how many heme groups
(a) 4 (b) 3 (c) 2 (d) 5

Q.2	**Answer any seven questions out of nine in Q.2**	**(14)**
1	How does rotation method differs from oscillation method ?	
2	Why one cannot determine the lattice parameter with the help of Laue method ?	
3	Name and state the equation used to determine the particle size.	
4	Draw the plot of intensity versus 2θ for fine particle size and bulk form.	
5	What is Friedel's law ?	
6	State the factors affecting the crystallization of biological macromolecules grown from solution method.	
7	Why myoglobin molecule exhibit ESR absorption spectra. ?	
8	Based on the localization energies, explain Pullman's criteria for a particular molecule which may be responsible for carcinogenic activity.	
9	Which parameters can be calculated from the tight binding model for a particular biological molecule ?	

Q.3(a)	Explain Debye Scherrer method used to determine the lattice parameter of a powder specimen.	**(6)**
Q.3(b)	In which X-ray method single crystal is rotated and film is translated ? Describe that method in detail.	**(6)**
	OR	
Q.3(b)	If single crystal is stationary and X-ray wavelength is not fixed , which method you will prefer for diffraction ? Explain it.	**(6)**
Q.4(a)	Discuss graphical method used to evaluate the lattice parameter of a cubic crystal.	**(6)**
Q.4(b)	Describe how Lorentz-Polarization factor plays a role to affect the intensity of diffraction line on a powder pattern.	**(6)**
	OR	
Q.4(b)	Derive the Scherrer's equation used to estimate the particle size of very small crystals from the measured width of diffraction curves.	**(6)**
Q.5(a)	Explain different methods known to you for synthesizing crystals of proteins at laboratory.	**(6)**
Q.5(b)	Discuss primary, secondary and tertiary structure of DNA.	**(6)**
	OR	
Q.5(b)	Explain how single crystal-ray diffractometry works.	**(6)**
Q.6(a)	How Electron spin resonance can be helpful to study myoglobin and hemoglobin molecules ? Explain in detail.	**(6)**
Q.6(b)	How proteins can be studied with the help of Infrared spectroscopy technique. ?	**(6)**
	OR	
Q.6(b)	Explain the use of Raman spectroscopy technique to study biomolecules.	**(6)**

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