[A-93]

M.Sc. (Physics)(IVth Semester) Examination
Date : 24 /04/2015, Day : Friday , Time :2.30 p.m. to 5.30 p.m.
Subject : Advances in crystallography and biophysics and Paper No. PS04EPHY01
CBCS(choice based credit system)

mportant 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

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

Q.1. **1. Keratin which is fibrous protein is an example of**
(a) α –helix (b) β –sheet   (c) γ-helix   (d) δ- helix
2. the protein solubility for crystallization can be reduced by the addition of
(a) additives   (b) precipitants (c) solvent   (d) none of these
3. . 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   (ii) P-H   (iii) P-C   (iv) P-N
4.In a myoglobin molecule which atom is located at the center and surrounded by four nitrogen atoms?
 (a) oxygen (b) iron (c) hydrogen (d) phosphorous
5.   The intensity of each diffraction peak is different and is function of
 (a)   Applied voltage (b) Bragg angle   (c) the orientation and its availability of the specific plane   (d) none of the above
6. Flat Metal screen to record the XRD pattern is used in
 (a) rotation (b) Weissenberg (c) precession (d) Single crystal diffractometer
7. X ray diffraction from a b.c.c. structure , does not reflects the plane
(a) (008) (b) (040) (c) (200) (d) (311)
8. The Bragg's angle for second order reflection from (100) plane is 30 degree, when Xray of wavelength is 1.542 A, the interatomic spacing is
(a) 3.31 (b) 3.084 (c) 3.33 (d) 3.13 A

Q.2. *Answer any seven questions out of nine*   (14)
   a.   Why the x ray camera radius required to be related to 57.3 mm ?
   b.   What do you mean by resolving power in crystal structure analysis. discuss with respect to debye – scherrer camera.
   c.   What is the origin of laue spots?
   d.   Give reasons for dark background and doublets in powder photographs
   e.   What is Wilson Plot?
   f.   Why the single crystal diffractometer is called as four circle diffractometer?

SARDAR PATEL UNIVERSITY
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diffractometer?**

g. State pullman's criterion for carcinogenic activity?

h. Why does the myoglobin molecule exhibit ESR absorption spectra?

i. Differentiate between a layerline photograph and layered photograph.

Q.3(a) Discuss a suitable technique for recording diffraction for a   6
stationary single crystal specimen . What is the role of
gnomonic projection in interpreting such a photograph?
What will be distance of a laue spot for 200 plane of Al crystal
exposed to W radiation from 40 KV Xray tube . The film is
5 cm from specimen.

Q.3(b) Give the sketch of powder diffractometer and discuss its   6
working.
An XRD pattern for a b.c. c. specimen recorded with CuKα
radiation , the first four lines are observed at θ =
20.3, 29.2, 36.7 and 43.6 , index the lines and calculate the
lattice parameter. Predict the maximum no. of lines.

OR

Q.3(b) Discuss the basic principle of recording diffraction from   6
rotating crystal and translating film method. How to you index
such pattern .

Q.4(a) Derive the necessary formula for determining particle size of   6
polycrystalline specimen under non ideal condition . Interpret
the result.

Q.4(b) Discuss a method of indexing the diffraction pattern from a   6
known cubic specimen graphically. How do you predict
Bravais lattice of the specimen from it.

OR

Q.4(b) A hexagonal XRD pattern- which is non – cubic to be   6
indexed – discuss a method for indexing the pattern.

Q.5(a) Give an account of primary , secondary and tertiary structure of   6
protein .

Q.5(b) Systematic absences can predict the space group symmetry   6
present in crystal structure – justify in the light of a suitable
technique.

OR

Q.5(b) Describe vapour diffusion and dialysis methods used for   6
crystallization of macromolecules.

Q.6(a) What are nucleic acids? Explain primary, secondary and   6
tertiary structure of DNA .

Q.6(b) Explain the role of fluorescence spectroscopy in providing the   6
information about molecular structure and dynamics of
biological molecules.

<center>OR</center>

Q.6(b) How does NMR work? Discuss NMR applications in   6
biophysics and medicines.

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