[97]

SARDAR PATEL UNIVERSITY

M. Sc. (Physics), 4th Semester Examination

17th April 2017, Monday

SEAT No._____ **Time: 02:00 PM TO 05:00 PM** No. of Printed Pages : 3

Subject: Applied Crystallography and Biophysics, Paper No. PS04EPHY01

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 each.

Max Marks: 70

Que 1 Write correct answer for each of the following MCQs. **[08]**

1 Doublets on the powder photograph is due to

a) K_α and k_β b) $K_{\alpha 1}$ and $K_{\alpha 2}$ radiation

c) K and L series of spectrum d) Continuous radiation

2 K line is ---------- than I line

a) Weaker and long wavelength b) Stronger and long wave length

c) Both aresame intensity and wavelength d) weaker and short wavelength

3 In Weissenberg method metal screen is

a) cylindrical and fixed b) cylindrical and translating

c) cylindrical and oscillating d) cylindrical and rotate

4 The diffraction pattern in precession method is in

a) Reciprocal lattice b) Direct lattice

c) It can be in both the lattice d) Reciprocal to reciprocal lattice

5 During double strand formation of DNA, the guanine of the first chain pairs with ------ of the second chain.

a) cytosin b) thymine

c) adenine d) guanine

6 In ESR, when external magnetic field is normal to the hemeplane and parallel to the internal field then Lande's factor is

a) 6 b) 8

c) 4 d) 2

7 The Raman spectra of nucleic acids has two distinct classes of lines, one arising from the bases and other due to

a) base-sugar b) base-phosphate

c) sugar-phosphate d) sugar-sugar

8 The precipitant used for crystallizing proteins in aqueous solution is.

a) polyamines b) polyethylene glycol

c) metal ions d) salts

(1)

Que 2 **Write answers of any seven questions.** **[14]**

1 What is Goniometer head .
What are festoons for in weissenberg method?

2 Obtain the resolution for debye – scherrer camera.
Does it depend on Xray wave length ?

3 What are atomic scattering factor and structure factors.
Discuss on what are the factors it depends.

4 True absorption of Xrays by material results in Fluoresence Xray- justify.

5 What is Wilson plot?

6 α helix and β sheet secondary structure of proteins differ from each other - discuss

7 State the factors affecting crystallization of biological macromolecule

8 Differentiate between myoglobin and haemoglobin molecule. Why does myoglobin molecule show ESR absorption spectra?.

9 How can you detect the double helical structure of nucleic acid by fluorescence spectroscopy technique?

Que 3 **[a]** Discuss a technique to record diffraction from a single stationary crystal . **[06]**
What minimum tube voltage is required to produce 110 reflection? The plane makes an angle of 45 degree with the incident radiation, and the film is at 5 cm from the specimen. Calculate the distance of the laue spots from the film .

[b] The maximum number of lattice parameters of a single crystalline specimen to be determined from a single diffraction pattern – discuss a suitable technique . Discuss the merit and demerit of such method . **[06]**

OR

[b] Discuss a suitable technique to characterize polycrystalline specimen for its internal structure . **[06]**
Calculate the maximum number of diffracted lines are possible for a bcc specimen with lattice parameter of 5.00 A exposed with Cuk radiation. Is there a change if the radiation is mok radiation ?

Que 4 **[a]** Xrays are unpolarized but behave like a polarized beam- discuss. **[06]**
Discuss the role of temperature factor on scattered intensity.

[b] Discuss a suitable analytical technique to index non cubic hexagonal pattern . **[06]**

OR

[b] Derive the necessary equation to calculate the particle size from diffraction under non ideal condition . **[06]**

Que 5 **[a]** Explain primary, secondary and tertiary structure of DNA. **[06]**

[b] Explain vapour diffusion and dialysis method to crystallize the protein. **[06]**

OR

[b] Give the working principle of single crystal diffractometer. Why does it called four circle diffractometer **[06]**

Que 6 **[a]** How NMR works ? Discuss NMR applications in biophysics and medicine. **[06]**

[b] Discuss delocalization in biomolecules specifically for benzene molecule **[06]**

and explain various parameters which can be obtained applying tight binding model to it.

OR

[b] Fluorescence spectroscopy can provide information about molecular conformation and dynamics of biological molecules- explain. **[06]**

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