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SARDAR PATEL UNIVERSITY

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

Day : Saturday , Date : 09/04/2016,Time : : 2.30 p.m. to 5.30 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 s.

1 The name of the technique where crystal rotates and film translates is

a) Rotation-Oscillation method. (b) Weissenberg (c) Precession (d) Diffractometer

2. Doblets in the Xray photograph is due to

a. Continuous xray b. from two different planes of very near d values c). K_{α_1} and K_{α_2} lines get splitted d) K_α and K_β lines get splitted.

3 Short wavelength limit depend on

b) applied voltage b) applied current c) both current and voltage d) does not depend on current and voltage

4. A zero layer (0kl) Weissenberg phptograph can reveal

i. b and c axes and α angle . ii b and c axes and β angle iii a and b axes iv a and c axes and γ angle

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. Two cysteine molecules combine together, to form ------ bond

(a) hydrogen (b) disulphide (c) peptide (d) ionic

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

(a) 6 (b) 8 (c) 4 (d) 2

Q.2 Answer any seven questions out of nine 14

1. What are soft Xray and hard Xray.
2. What is absorption coefficients? Mention its role in Xray production.
3. Give the origin of different peak heights in diffractogram and different curved lines on powder photograph.
4. What are antigen and antibodies?
5. list the three commonly measurable parameters which are used to obtain the image of tissues in MRI.
6. what is the basic necessity to have the powder camera radius in multiple of some specific constant value?
7. Sketch the four circle diffractometer and highlight its working.
8. How Raman Spectroscopy can be used to probe the structure of proteins and nucleic acids ?
9. When DNA is said to be positively supercoiled and negatively supercoiled ? What are A and B forms of DNA ?

Q.3(a) Justify the statement ; Laue method is insufficient for revealing internal structure of a specimen. What is the role of gnomonic projection in this method. 6

Q.3(b) Discuss a suitable Xray technique to characterise a single crystal specimen oscillating ±10 degree about its axis and exposed by monochromatic radiation .two layer line observed on the oscillation photographs are at 0.84 cm and 1.94 cm away from the zero layer lines recorded with Mok radiation. Camera diameter is 57.3 mm . Calculate the lattice parameter. 6

OR

Q.3(b) A thin industrial sheet is to be characterised for its internal structure. Discuss a suitable modern Xray technique with recording medium as a detetor to record the Xray diffraction pattern using MoKα radiation . How to calculate the lattice parameter and index the pattern from such a data if the specimen is cubic ?
A polycrystalline specimen is exposed with MoKα radiation at 120° C. The 111 line has been shifted by 0.45 °. Calculate the coefficient of thermal expansion of the specimen. The lattice parameter at room temperature is 4.05Å. 6

Q.4(a) Derive the scherrer equation from an non –ideal condition diffraction. Interpret the result. 6

Q.4 (b) List the factors responsible for modifying the scattered Xray intensity. What are absolute and relative intensity of Xray. Discuss the polarization factor, absorption factor and multiplicity factor in detail. 6

OR

Q.4 (b) Obtain the structure factor equation for ZnS crystal structure and prepare the chart for the extinction of reflections. 6

Q.5 (a) i. Write about : Wilson plot
ii true absorption of Xrays give rise to fluorescent Xrays- discuss 6

Q.5 (b) Explain primary, secondary, tertiary and quaternary structures of proteins 6

OR

Q.5 (b) Draw a typical Xray spectrum from an Mo Xray tube and discuss the spectrum with a special mention of the origin of continuous and characteristic Xrays. 6

Q.6 (a) Discuss delocalization in bio molecules specifically for benzene molecule and explain various parameters which can be obtained applying tight binding model to it. 6

Q.6(b) How does Raman spectroscopy differ from IR spectroscopy ? Explain the use of Raman spectroscopy to study proteins and nucleic acids. 6

OR

Q.6(b) Explain fluorescence spectroscopy to provide information regarding molecular conformation and dynamics of biological molecules. 6