

(i) Printed Pages : 3

Roll No.

(ii) Questions : 9

Sub. Code :

1	7	5	4	9
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Exam. Code :

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B.A./B.Sc. (General) 6th Semester

(2056)

CHEMISTRY

Same for B.Sc. Microbial and Food Technology

Paper-XXIII : Physical Chemistry-B

Time Allowed : 3 Hours]

[Maximum Marks : 22

Note :— Attempt **FIVE** questions in all. Question No. 1 (Which is **COMPULSORY**) and attempt remaining **FOUR** questions by selecting **ONE** question each from (Unit II-V).

UNIT—I

1. (a) Taking a cubic system and draw planes with Miller indices (112) and (210). 1
- (b) Give the significance of 'n' in the Bragg's equation $n\lambda = 2d \sin \theta$. 1
- (c) Why do crystalline solids undergo clean cleavage? 1
- (d) Calculate the degrees of freedom of :
 - (i) Acetylene molecule 1
 - (ii) Water molecule. 1
- (e) What are the advantages of Raman spectroscopy over infrared spectroscopy? 1
- (f) What are Chromophores? 1

UNIT—II

2. (a) Derive expression for the distance of separation of the (hkl) planes of an orthogonal system. 2
- (b) Define the different elements of symmetry present in crystals. Define the law of symmetry. 2
3. (a) What are different types of crystalline solids? Give the constituent particles, the types of forces present and the important properties of each of them. 2
- (b) Define the terms 'crystal lattice' and 'unit cell'. Why a five-fold axis of symmetry cannot be present in any crystal? 2

UNIT—III

4. (a) Derive Bragg's equation for X-ray diffraction by crystals. 2
- (b) Explain the crystal structure of NaCl with diagram. 2
5. (a) Briefly describe Powder method for X-ray diffraction studies by crystals. What are its advantages over Bragg's method? 2
- (b) Justify why the lines in the X-ray diffraction pattern of a body-centred cubic lattice are equally spaced. 2

UNIT—IV

6. (a) What is Born Oppenheimer approximation? What is its use in molecular spectroscopy? 2
- (b) Derive an expression for the wave numbers of rotational levels of a non-rigid rotator. 2

7. (a) What do you understand by degrees of freedom of motion of a molecule? Briefly explain the different types of degrees of freedom possessed by linear and nonlinear molecules. 2
- (b) What are basic components of a spectrometer? Show them diagrammatically. 2

UNIT—V

8. (a) Explain Raman spectra on the basis of polarizability of molecules. 2
- (b) State and explain Frank-Condon principle. 2
9. (a) What are symmetric, asymmetric, bending modes of vibration? Explain with suitable example. 2
- (b) Explain briefly intensity of electronic bands on the basis of electronic transitions. What happens if an acid is present? 2