

PHYSICAL CHEMISTRY – III

(Common for B.Sc., Bio-Tech and B.Sc. Industrial Microbiology Semester-VI)

Time Allowed : Three Hours

Maximum Marks : 35

Note : Attempt five questions, selecting two questions each from Section A and B. Section C is compulsory.

SECTION-A

- I. (a) On the basis of polarisability, explain which type of molecules will be Raman active and which will be inactive. 4
(b) Discuss the selection rules for rotation-vibration Raman spectrum of diatomic molecules. 3
- II. (a) Briefly explain Franck-Condon principle. 4
(b) Explain the formation of electronic band spectrum on the basis of potential energy curves. 3
- III. Draw Jablonski diagram. Depict the non-radiative and radiative transitions, internal conversion and radiative transitions, fluorescence and phosphorescence. What should be the type of multiplicity for fluorescence and phosphorescence? 7
- IV. (a) Explain the term 'photosensitization' with the help of suitable example. 4
(b) Differentiate between thermal and photochemical processes. 3

SECTION-B

- V. (a) Derive Bragg's equation for X-ray diffraction by crystals. 4
(b) State and explain law of constancy of interfacial angles. 3
- VI. Determine the crystal structure of CsCl using Laue's method. What type of lattice has been observed? Represent it diagrammatically. What are the co-ordinates of the different Cs⁺ and Cl⁻ ions in the CsCl crystal? 7
- VII. What are the elements of symmetry in crystallography? Describe each of them briefly with the help of suitable examples. 7
- VIII. (a) Write short notes on the following :
(i) Law of rationality of indices. (ii) Law of symmetry elements in crystals. 4
(b) Differentiate between crystalline and amorphous solid. 3

SECTION-C

- IX. (a) What are isotropic molecules ?
(b) Which out of singlet state and triplet state has lower energy ?
(c) Name two laws of photochemistry. (d) Define quantum yield.
(e) Which crystal system is isotropic ? (f) Define space lattice.
(g) What are photo-inhibitors ? (7×1=7)
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