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M-6316

M.Sc. (Ist Semester) Examination, 2020

CHEMISTRY

(Group Theory, Spectroscopy & Diffraction Methods)

Time Allowed : Three Hours

Maximum Marks : 70

Minimum Pass Marks : 25

Note : Attempt all the five questions, selecting one question from each unit. All questions carry equal marks.

Unit - I

Q. 1. (a) Discuss the identification of unit cells from systematic absences in diffraction pattern. **10**

(b) The utilized reflecting plane of LiF crystal has a d value of 2.014 A°. Calculate the wavelength of second order diffracted line which has a value of 50.1° ? **4**

Or

(a) Derive the following equation : **10**

$n\lambda = 2d \sin \theta$

(b) Discuss Laue's method of X-ray structural analysis of crystals. **4**

Unit - II

Q. 2. (a) Show that symmetry operations of C_{3v} point group form a mathematical group. **10**

(b) Determine number of classes of C_{3v} point group. **4**

Or

(a) Discuss the different rules arises from the solution of orthogonality theorem. **10**

(b) Explain symmetry elements present in trans-CH_2Cl_2. **4**

Unit - III

Q. 3. (a) Discuss the basic theory and instrumentation of fluorescence spectroscopy. **10**

(b) Write short note on photo-ionization process. **4**

Or

(a) Explain the various modes of re-emission of energy of a molecule in electronically excited states. **10**

(b) How will you obtain a photoelectron spectrum ? **4**

Unit - IV

Q. 4. (a) Write in brief the basic principle of nuclear magnetic resonance spectroscopy. How do NMR and ESR differ in technique and applications. **10**

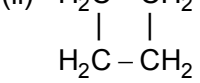
(b) C^{13} is NMR active while C^{12} is not. Explain. **4**

Or

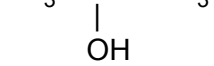
(a) What do you mean by Coupling Constant ? Discuss the factors affecting coupling constant in detail. **10**

(b) How many number of signals obtained in the following compounds : **4**

(i) CH_3COCH_3

(ii) 

(iii) CH_3OH

(iv) 

Unit - V

Q. 5. (a) Discuss the following : **10**

(i) Factors affecting the ‘‘g’’ value

(ii) Zero field splitting

(b) Explain the rules for predicting number of hyperfine line. **4**

Or

Explain the instrumentation, experimental technique and applications of ESR spectroscopy in detail. **14**