Roll No. _____ **Code No. Q-4310**

SECOND SEMESTER EXAMINATION 2021-22

M.Sc. CHEMISTRY

Paper - IV

Spectroscopy, Diffraction Methods & Computer For Chemists

Time : 3.00 Hrs. **Max. Marks : 80**

Total No. of Printed Page : 03 **Mini. Marks : 29**

Note:- Question paper is divided into three sections. Attempt question of all three section as per direction Distribution of marks is given in each section.

Section 'A'

Very short answer question (in few words)

Q.1 Attempt any six questions from the following : 6x2=12

(i) Determine the term symbols for s^1p^1 and d^7s^1 ?

(ii) Calculate the number of microstate for $p4$ and $d4$ configurations ?

(iii) At what field would the methyl radical come into reasonance in a spectrometer operating at 10.5 GMz ?

(iv) Why water and alcohol are not suitable solvents for ESR studies ?

(v) Electron diffraction is particularly useful in studying the surfaces of materials. Why ?

(vi) Write three important requirements of a specimen to be suitable for the obsertavtion in an electron microscope ?

(vii) What is the need of flow chart ?

(viii) What do you understand by Program Language ?

(ix) What do you mean by Desktop ?

(x) What is the fundamental differences in between Instruction and Information ?

Section 'B'

Short answer type question (in 200 words)

Q.1 Attempt any four questions from the following : 4x5=20

(i) Calculate the wave number and energy of a radiation of wavelength $4000\,\overset{0}{A}$?

(ii) Write the name of factors affecting resolution and strength of the signal in the case of Photo-electron spectroscopy ?

(iii) Calculate the NQR frequencies for a nucleus with spin $I = 9/2$ in an axially symmetric EFG ? Show how do they arise ?

(iv) Calculate Miller indices of a crystal planes which cut through axes at $2a, -3b$ and $-3c$?

(v) Differentiate ESR and NMR spectroscopy ?

(vi) What do you mean by branching and looping statements ?

(vii) Discuss constant and variables ?

(viii) Write short notes on different menu availabel in MS Word ?

Section 'C'

Long answer/Essay type question. 4x12=48

Q.3 Attempt any four questions from the following questions :

(i) Discuss the basic principle, instrumentation and applications of PHOTO ELECTRONIC SPECTROSCOPY ?

(ii) Explain vector representation of momenta and vector coupling in detail ?

(iii) Explain factors affecting chemical shift ? Which of the following is NMR active :-

$_1H^1$, $_6C^{12}$, $_6C^{13}$, $_9F^{19}$, $_8O^{16}$

(iv) Derive Bragg's equation ? How Bragg's equation is useful to identify cubic structures ?

(v) (a) Which of the following is ESR active :-

O_2, O_2^+, N_2, CH_3' radical and Cu^{2+}

(b) Discuss principle of ESR with special reference to zero field splitting and orbital energy degeneracy ?

(vi) Write programming in "C" to calculate value of rate constant K of the expression :-

$$k = \frac{2.303}{t} \log \frac{a}{a-x}$$

(vii) Write note on any THREE of the following :-

(a) Operators and expressions.

(b) Structure and Unions

(c) Pointers

(d) UNIX and Window

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