

G-2/216/21

Roll No.

M.Sc. II Semester Examination, 2021**CHEMISTRY****Paper IV**

(Spectroscopy and Computer for Chemist)

Time : 3 Hours]

[Max. Marks : 80

Note : All questions are compulsory. Question Paper comprises of 3 sections. **Section A** is objective type/Multiple Choice questions with no internal choice. **Section B** is short answer type with internal choice. **Section C** is long answer type with internal choice.

SECTION A**1×8=8****(Objective Type Questions)**

Choose the correct answer :

1. No NMR signal would be observed if :
 - (a) populations of the upper and lower energy states were equal
 - (b) populations of the upper energy state is greater than lower energy states
 - (c) populations of the upper energy state is less than lower energy states
 - (d) NMR signals does not depends upon populations states

P.T.O.

2. The correct decreasing order of Larmer frequency of NMR active nucleus is :
 - (a) $^1\text{H} > ^{13}\text{C} > ^{15}\text{N} > ^{19}\text{F}$
 - (b) $^1\text{H} > ^{13}\text{C} > ^{19}\text{F} > ^{15}\text{N}$
 - (c) $^1\text{H} > ^{19}\text{F} > ^{13}\text{C} > ^{15}\text{N}$
 - (d) $^{13}\text{C} > ^{19}\text{F} > ^{15}\text{N} > ^1\text{H}$
3. X-rays are generated by :
 - (a) Geiger tube (b) Goniometer
 - (c) Coolidge tube (d) Rotameter
4. One of the widely used target material for generation of X-ray spectral line is :
 - (a) Zinc (b) Molybdenum
 - (c) Xenon (d) Manganese
5. Which of the following is used as detector crystal in ESR spectrometer ?
 - (a) Silicon rectifier
 - (b) Silicon tungsten rectifier
 - (c) Silicon boron rectifier
 - (d) Silicon quartz rectifier
6. Which is reference standard in ESR ?
 - (a) KBr (b) NaCl
 - (c) DPPH (d) Cu

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7. MS-Word is an example of :

- (a) An operating system
- (b) A processing device
- (c) Application software
- (d) An input device

8. The process of dividing the disk into tracks and sectors :

- (a) Tracking (b) Formatting
- (c) Allotting (d) Crashing

SECTION B

4×6=24

(Short Answer Type Questions)

Note : Answer the following questions in maximum 250 words.

Unit-I

1. (a) How does saturation affect the sensitivity of an NMR experiment ?
- (b) What is phase cycling and why is it used in NMR spectroscopy ?

Or

Summarize the common methods for enhancing sensitivity in NMR spectroscopy.

Unit-II

2. What is electronic transition in X-ray crystallography ? Explain K-series and L-series in XRD.

Or

In a diffraction experiment with ordinary light (wavelength = 5000 Å), a grating is made by scratching thin lines on glass. Why doesn't that work well for electrons or X-rays ?

Unit-III

3. Define Lande splitting factor. Explain factors affecting it.

Or

Define resonance frequency. A free electron is placed in a magnetic field of strength 1.3 T. Calculate the resonance frequency, if $g = 2.0023$.

Unit-IV

4. Write a program using IF-THEN/ELSE Statements.

Or

What is Computer programming ? Explain different types of errors which can occur during the execution of a program ?

SECTION C

4×12=48

(Long Answer Type Questions)

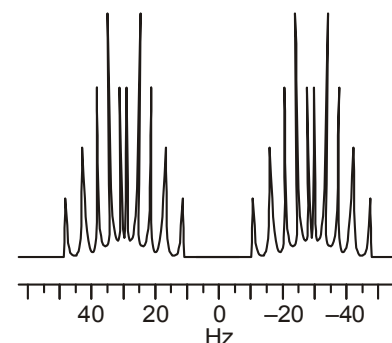
Note : Answer the following questions in maximum 500 words.

Unit-I

1. (a) What is the magnetogyric ratio, and how does it affect the energy difference between two states and the nuclear species sensitivity to the NMR experiment ?
- (b) Draw and explain peaks in NMR spectra of :
- 1, 2-dimethylbenzene,
 - 1, 3-dimethylbenzene,
 - 1, 4-dimethylbenzene.

Or

Explain coupling constant. The given Figure shows the ^{19}F resonance of the CF_2H group of 1, 1, 1, 2, 2, 3, 3-heptafluoropropane. $\text{CF}_3\text{CF}_2\text{CF}_2\text{H}$. The two fluorine are equivalent and are coupled to all the other magnetically active nuclei in the sample. Find out the various multiplet patterns and measure the coupling constants $^2J(\text{F-H})$, $^3J(\text{F-F})$ and $^4J(\text{F-F})$.



Unit-II

2. Explain the following :
- Laue method,
 - Rotating crystal method,
 - Braggs method.
- Or
- Explain Wierl equation and its importance in electron diffraction.
 - Explain different types of neutron scattering instruments.

Unit-III

3. Discuss the ESR spectrum of the following species :
- 1, 4-benzosemiquinone radical,
 - sodium atom.

Or

Discuss hyperfine splitting rules for predicting the nature of ESR spectrum for more than one magnetic nucleus with example.

Unit-IV

4. (a) Define Loops. Discuss various types of Loops.
(b) What are constants ? Explain various types of constants.

Or

- (a) Explain the following any three :
(i) High Level language,
(ii) Assembly language.
(b) Explain errors and discuss its various types.

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