Sixth Semester B.Sc., Degree Examinations

MAY/JUNE 2026

(NEP CBCS Scheme)

(New Syllabus 2021 onwards)

CHEMISTRY

NSF 0560: PAPER: SPECTROSCOPY – I

Time: 2 hrs] [Max. Marks: 60

Instructions to Students:

1. ***The Students should legibly write Section number along with question numbers within the margin ONLY.***
2. ***The answer without Section number and question numbers will not be valued.***
3. ***Draw neat and labelled diagram wherever necessary.***
4. ***Use of Scientific non programmed calculator is permitted.***
5. ***Section – I multiple Choice Questions should be answered in the first page of main answer book and same questions shall not be answered repeatedly.***
6. ***Any identifications like marking, ticking, dots etc., in the options of MCQ (Section – I) on the question paper is strictly prohibited. Do not write anything (except register number) on the question paper.***

SECTION – I

Each one the following questions is provided with four answers a, b, c and d. Choose the correct answer among them and write it along with the respective answer in the main answer book: $10 \times 1 = 10$

I - 1) An effect by virtue of which absorption maximum is shifted towards longer wavelength due the presence of an auxochome or by the change of solvent.

a) Bathochromic shift b) Hypsochromic shift

c) Hyper chromic shift d) None of these

I - 2) Energy for ionization of sample in mass spectrometry.

a) 8-10 eV b) 70 eV c) 20-30 eV d) 15-18 eV

I - 3) The difference in the absorption position of the proton with respect to TMS signal is called as

a) Chemical shift b) Magnetic shift

c) Nuclear shift d) None of the above

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I - 4) The most intense or the abundant peak in the mass spectrum of the compound is called as

a) Molecular ion peak b) Base peak
c) Metastable peak d) None of these

I - 5) The radiation used in electron paramagnetic resonance spectroscopy is

a) Radio wave b) UV c) IR d) Microwave

I - 6) A set of elements in a group which are conjugate to one another is said to form a

a) Sub-group b) Point group c) Class d) None of these

I - 7) Ammonia molecule belongs to _____ point group

a) C_{2v} b) C_{3v} c) C_1 d) C_2

I - 8) Raman effect is _____

a) Inelastic scattering of light b) Elastic scattering of light
c) Absorption of light d) All of these

I - 9) The range of IR radiation

a) 200 to 400 nm b) 400-800 nm
c) 2.5 to 15 μ d) None of these

I - 10) Most widely used flame in atomic absorption is

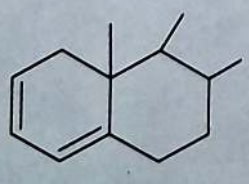
a) Air acetylene b) Air propane
c) Air coal gas d) Oxyacetylene

SECTION – II

Answer any FIVE of the following: 5 × 3 = 15

II - 1) Discuss the homolytic cleavage in mass spectrometry with two example.

II - 2) Calculate the absorption maximum for the following compound.



II - 3) Explain Mc-Laffertty rearrangement.

II - 4) Discuss Strokes and anti-Stroke lines and their intensities.

II - 5) Explain shielding and de-shielding mechanism in NMR spectroscopy.

II - 6) Discuss the flame atomizer used in atomic absorption spectroscopy.

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II - 7) Explain distinction of *cis*- and *trans*- isomers using UV spectroscopy by taking suitable example.

II - 8) Discuss Great orthogonality theorem and mention its applications.

SECTION – III

Answer any THREE of the following: $3 \times 5 = 15$

III - 1) Explain the instrumentation of Raman Spectroscopy.

III - 2) Discuss the applications of Electron Paramagnetic Resonance (EPR) spectroscopy.

III - 3) Discuss fundamental frequencies, overtones and hot bands.

III - 4) Explain relaxation process in NMR spectroscopy.

III - 5) Explain different types of electronic transitions of organic molecules.

SECTION – IV

Answer the following: $2 \times 10 = 20$

IV - 1) i) Explain structural information from NQR spectra.

ii) Explain the instrumentation of Mass spectrometer. (5 + 5)

OR

i) Discuss the factors influencing chemical shift in NMR spectroscopy.

ii) Sketch and discuss the ^{1}H NMR spectra of Ethanol and p – Xylene. (5 + 5)

IV - 2) i) Write Woodward-Fischer rule for calculating absorption maximum of $\alpha,\beta-$ unsaturated ketones.

ii) Discuss the different types of fundamental molecular vibrations in IR spectroscopy. (5 + 5)

OR

i) Discuss group multiplication tables for C_{2v} symmetry taking water as an example.

ii) Explain various types molecular spectra of a molecules. (5 + 5)

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