

- (d) Define wave number. How is it related to frequency and wavelength. Why do we use wavenumber in an IR spectrum? (4,3,4,4)

[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1491

I

Unique Paper Code : 2172543502

Name of the Paper : DSC-B5: Instrumental Methods of Analysis-I

Name of the Course : B.Sc. Prog. Analytical Chemistry

Semester : V

Duration : 2 Hours

Maximum Marks : 60

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **four** questions in all.
3. Use of simple calculator is allowed.

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1. (a) Calculate the wavelength and energy in joules associated with NMR signal at 368 MHz?
($h = 6.6 \times 10^{-34} \text{ m}^2\text{Kg/s}$).
 - (b) What is the difference between IR and Raman Spectroscopy? Explain with examples.
 - (c) Predict in which range the amines stretching peak is observed in IR spectroscopy.
 - (d) What are the different modes of vibration in IR spectroscopy? (3,4,4,4)
2. (a) What are the different characteristics of a wave.
 - (b) Explain absorption and emission spectroscopy with example.

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- (b) Explain different types of light sources used in optical instruments.
 - (c) What is Spectroscopy? Explain the principle of UV spectroscopy and its mode of Transitions.
(5,5,5)
6. (a) Explain the term Bathochromic shift and hypsochromic Shift with examples.
 - (b) What are the factor that affect the carbonyl peak in IR spectroscopy?
 - (c) What do you mean by the term chromophore and auxochrome? Give one example of each.

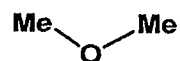
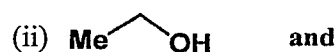
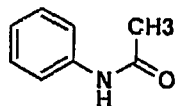
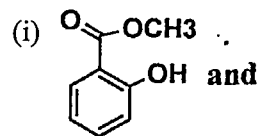
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(c) Write the different transitions possible in UV spectroscopy.

(d) Distinguish the following pairs of compounds by IR spectroscopy



(3,4,4,4)

5. (a) Explain the working of a Raman spectrophotometer.

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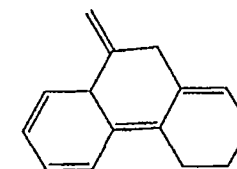
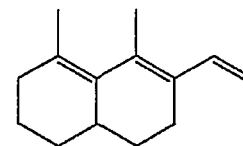
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(c) What is Rayleigh scattering? How it is different from Stoke's and anti Stoke's scattering?

(d) What is the wavelength of a photon that has three times as much energy as that of a photon whose wavelength is 779 nm. ($c = 3 \times 10^8$ m/s).

(4,4,4,3)

3. (a) How will you use UV spectral data to distinguish among the following isomeric systems?



(Calculate λ_{max} using Woodward Fieser rule)

P.T.O.

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Base value for homoannular (cisoid) diene =
253 nm

Base value for heteroannular (transoid) diene =
214 nm

Base value for acyclic conjugated diene = 217 nm

Base value for Acyclic enone = 215 nm

Increment for :

Alkyl substituent or Ring residue attached to the
parent diene = 5 nm

Double bond extending conjugation = 30 nm

Exocyclic double bonds = 5 nm

Homoannular diene component = 39 nm

α -alkyl group or ring residue = 10nm

β -alkyl group or ring residue = 12nm

γ - and higher alkyl group or ring residue = 18nm

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(b) How will you distinguish between maleic acid and
fumaric acid on the basis of IR spectroscopy?

(c) What is LASER. How it is produced. What is its
use in Raman spectroscopy?

(d) How sampling is done for different state of the
sample while scanning is done in IR spectrum
spectrometer? (4,3,4,4)

4. (a) Write different stretching modes of carbon
dioxide and predict whether they are IR or Raman
active?

(b) Explain the term superposition of waves and optical
interference?

P.T.O.