Or

(b) Write short notes on the following :   16

   (*i*) CI and FAB mass spectra

   (*ii*) α cleavage

   (*iii*) Molecular ion peak

   (*iv*) Base peak.

———————

2019

Time : 3 hours

Full Marks : 80

Answer from **both** the Sections as directed

The figures in the right-hand margin indicate marks

Candidates are required to answer in their own words as far as practicable
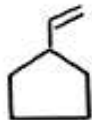
(APPLICATION OF SPECTROSCOPY)

SECTION – A

1. Answer any *four* of the following : 4×4

   (*a*) What is the essential requirement for a solvent to be used in UV spectroscopy ? Why is ethanol a good solvent in UV ?

   (*b*) Write the Woodward Fieser rule for calculating (λ_{max}) in conjugated dienes.

   (*c*) Write the characteristic features of overtones and combination bands.

(2)

(d) Explain Zeno-Field Splitting.

(e) How many peaks in $^{13}CNMR$ for the following compounds used be obtained

(i) $H_3C-C \equiv C-CH_3$

(ii)

(iii)

(iv)

(f) Write down fragmentation pattern of acetone and butanal.

Or

2. Answer *all* questions from the following : 2×8

(a) How will you distinguish the following compounds from their pairs on the basis of IR spectra ?

(*Continued*)

(3)

(i) $C_6H_5COCH_3$

(ii) CH_3COCH_3

(b) In IR spectrum two bands appear near $3500 \ cm^{-1}$ and $1050 \ cm^{-1}$ respectively, identify the compounds.

(c) How many different types of H are present in the following :

(i) $CH_3 - CH_3$

(ii) $CH_3CH_2CH_2Br$

(d) What is Trimethylsilane ? How is it useful in ^1HNMR ?

(e) How isotopes abundance is useful for determining molecular formula.

(f) How you can determine the base peak in the mass spectra ?

(g) Why azulene blue in colour ? Explain.

(h) Which type of absorption is useful for determining the band gap in the molecules.

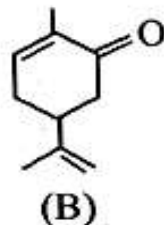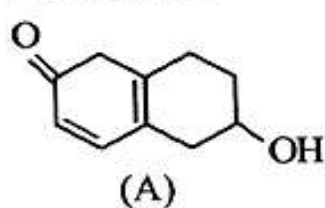(*Turn Over*)

SECTION – B

Answer **all** questions : 16×4

3. (a) (i) Derive the Beer-Lambert law. How is it
             useful to calculate the concentration of
             the compound at a given λ_{max}.   8

    (ii) Two main peaks are obtained in the
          UV-spectrum of acetone at $\lambda_{max} = 279$ mμ
          and $\lambda_{max} = 189$ mμ. Write down the
          electronic transitions for each peak.   3

    (iii) Calculate λ_{max} of the following
          compounds :   5
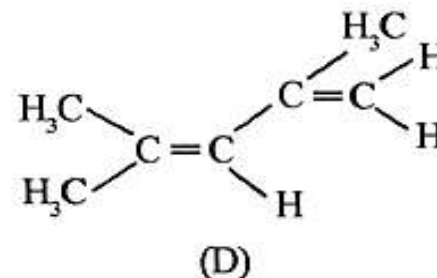

(A)   (B)

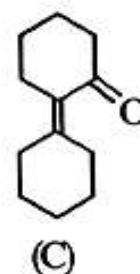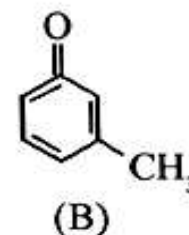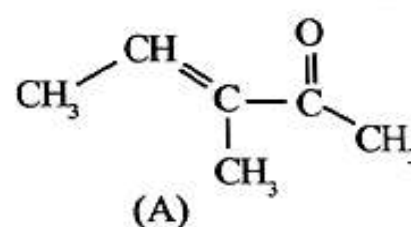*Or*

(b) (i) Explain different types of electronic
         transition in U.V. spectrometry.   8

(ii) Calculate the λ_{max} of the following
      compounds using Woodwards Fieser
      rule :   8

(A)   (B)

(C)   (D)

4. (a) (i) Find out the expression for Hook's law.   6

    (ii) Distinguish between maleic acid and
          fumaric acid using IR spectroscopy.   8

    (iii) Indicate the principal absorption regions
          in the IR spectra of the dimethyl ether.   2

Or

(b) (i) Highlight the principal of IR spectros-
copy.   8

(ii) Give reasons   8

(A) Which one is more energetic
between stretching and bending
vibrations.

(B) In IR spectrum four bands appear at
$3030 \ cm^{-1}$, $1710 \ cm^{-1}$, $1280 \ cm^{-1}$
and $945 \ cm^{-1}$, respectively, identify
the compound.

5. (a) (i) What do you understand by PMR
spectroscopy ? Describe its principle
and applications. How will you interpret
PMR spectra of ethanal ?   14

(ii) A compound having molecular formula
C_7H_8 presents following PMR data,
write down its structure.   2

— singlet δ, $\cdot 09$, 3H
— singlet, δ, $7 \cdot 2$, 5H

Or

(b) (i) What do you understand by chemical
shift and spin-spin splitting ?   8

(ii) Write down the structure of the
following compounds whose NMR data
are as below :   8

(A) $C_4H_{10}O$ $\delta 1 \cdot 28$ (δ, 9H), $\delta 1 \cdot 35$ (δ, 1H)

(B) C_3H_7Br $\delta 1 \cdot 7$ (d, 6H), $\delta 4 \cdot 3$ (Septet, 1H)

6. (a) (i) Discuss the Mc-Lafferty rearrangement
for the following :   8

A — Amide functional group

B — Ester functional group

(ii) How would you distinguish between
pentanal-1 and pentanal-2 using mass
spectrometry ?   4

(iii) Describe metastable ion and how do it
formed ?   4