

(2 ½ hours)

Total Marks:60

N.B. (1) All questions are **compulsory**.(2) **Figures** to the **right** indicate **full** marks.Q.1 A Attempt **any two** of the following: 8

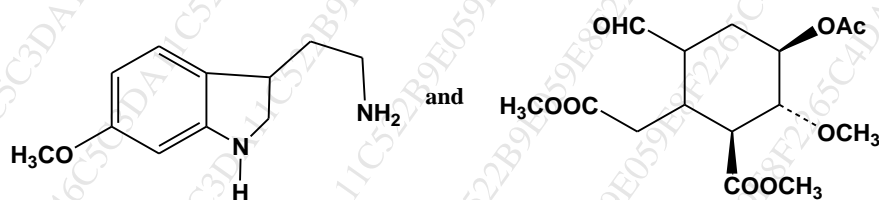
- Explain structural features and applications of Starch and Cellulose.
- Give evidence for
 - reducing sugar in Lactose is Glucose
 - Glucose and Galactose are linked through β -glycosidic linkage in Lactose.
- Give the synthesis of Ubiquinone from 3,4,5-trimethyl acetophenone.
- Give structural features and biological importance of carotenoids and anthocyanins.

Q.1 B Attempt **any one** of the following: 4

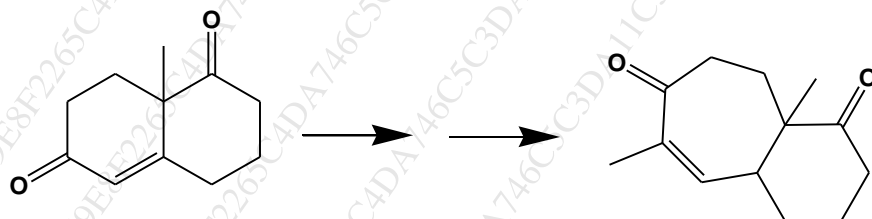
- Give the Synthesis of Bombykol from acetylene.
- Give the synthesis of Atropine.

Q.2 A Answer **any two** of the following: 8

- How is reserpine synthesized from the following compounds?



- Outline the steps involved in the following conversion as a part of Longifoline synthesis.



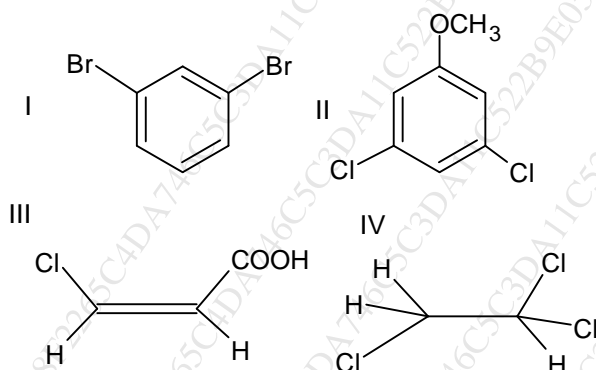
- Give Gilbert-stork synthesis of Griseofulvin from phloroglucinol.
- Give analytical evidence for structural elucidation of PGE1.

Q.2 B Answer **any one** of the following: 4

- Write structural features and give the applications of Gibberelic acid.
- Give analytical evidence for the structure determination of PGE₁α.

Q.3 A Answer **any two** of the following: 8

- Using spin system notation, designate the type of spin system in the following compounds.



- Explain the terms chemical and magnetic equivalence of protons with suitable examples.

- Calculate ¹³CNMR shift for all aromatic carbons using incremental shifts of all the aromatic carbon atoms from the table given below for the following compounds.

- Salicylaldehyde
- p*-Hydroxyacetophenone

Substituents	Increments in ppm			
	Ipsso	Ortho	Meta	Para
-OH	+27.0	-13.0	+1.0	-7.0
-CHO	+9.0	+1.0	+1.0	+6.0
-COCH ₃	+9.0	+1.0	+1.0	+6.0

- Explain long range coupling in aromatic and allylic compounds.

Q.3 B Answer **any one** of the following: 4

- The proton NMR spectrum for a compound with formula C₈H₁₈ shows only one peak at 0.86 ppm. The ¹³CNMR spectrum has two peaks, a large at 26 ppm and a small one at 35 ppm. Predict the structure of this compound.

- b. A compound having molecular formula $C_8H_8O_2$ shows following data:

UV: 250,265 nm

IR (cm^{-1}): 2700-3500 (very broad), 1700, 1600 (w), 1500, 920

1H NMR (δ ppm): 3.5 (12mm, s), 7.2 (30mm, s), 12.3 (6mm, s)

Assign suitable structure to the compound and state the number of signals obtained in its proton decoupled ^{13}C NMR spectrum.

Q.4 A Answer **any two** of the following: 8

- a. Explain COSY technique with suitable example.

- b. A compound shows following spectral data:

Mass spectrum(m/e): $M^+ = 102$

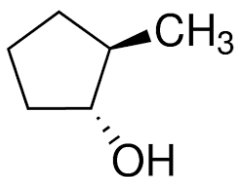
IR (cm^{-1}): 1735(s), 1250(s)

1H NMR (δ ppm): 4.023(t, 2H), 2.050(s, 3H), 1.65(m, 2H), 0.95(t, 3H)

^{13}C NMR (δ ppm): 171.09, 66.10, 22.14, 20.91, 10.41

What is the structure of the compound?

- c. What is NOE? What is its significance? Explain with suitable example.
- d. The following chemical shifts are obtained in the ^{13}C NMR spectrum of the compound



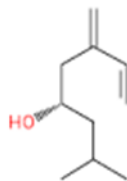
(δ ppm) 17.3, 20.9, 31.0, 33.2, 41.5, 79.2

Match the chemical shifts with the appropriate carbons and draw its proton decoupled ^{13}C NMR, DEPT-90 and DEPT-135 spectra.

Q.4 B Answer any one of the following:

4

- Explain NOESY technique with suitable example.
- The following chemical shifts are obtained in the ^1H NMR and ^{13}C NMR spectrum of the compound



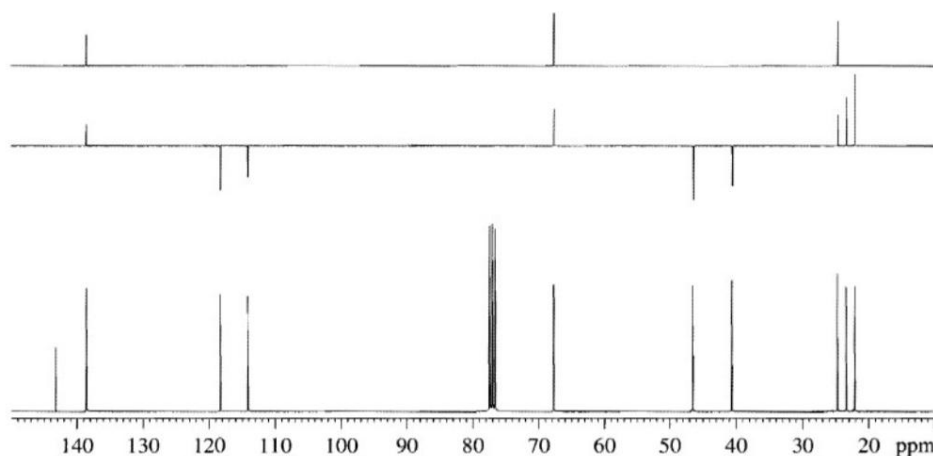
^1H NMR(δ ppm): 0.93, 1.28, 1.42, 1.8, 1.82, 2.21, 2.48, 3.83, 5.08, 5.15, 5.24, 5.26, 6.40.

^{13}C NMR(δ ppm): 22.0, 23.5, 25.0, 40.8, 47.0, 67.8, 118.2, 138.5, 143, 143.3

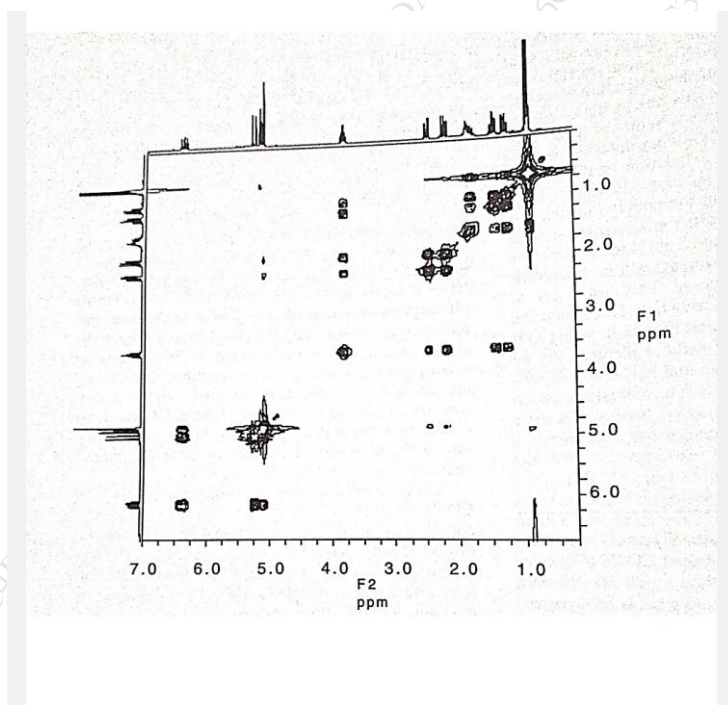
Its ^{13}C NMR, DEPT-90, DEPT-135, COSY and HETCOR spectra are given.

Match the values to appropriate protons and carbons and justify your answer by using the spectra.

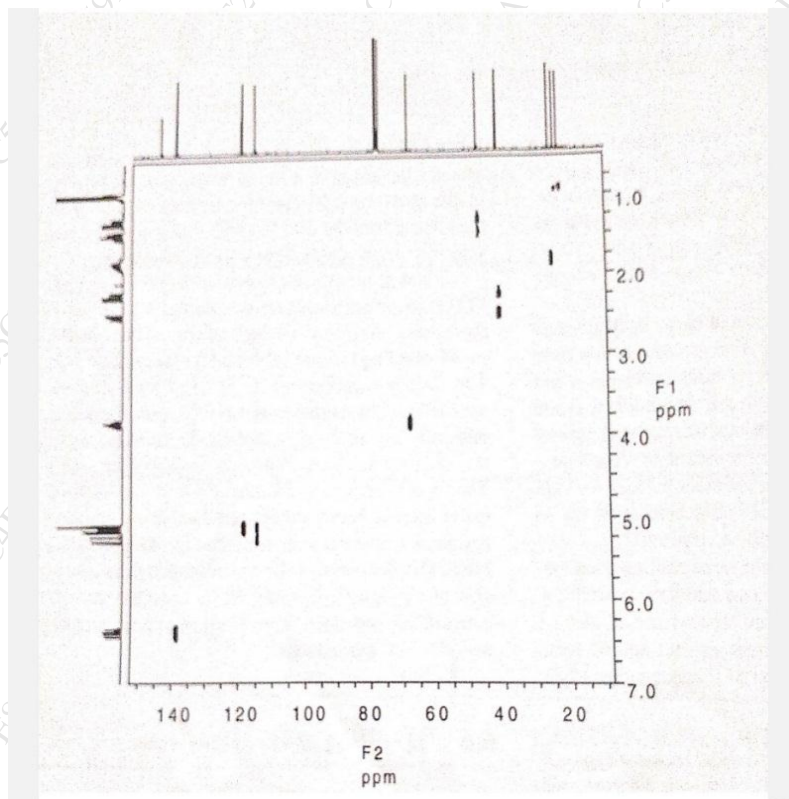
DEPT:



COSY:



HETCOR:



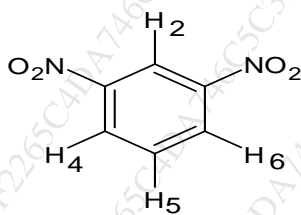
Q.5 Answer **any four** of the following: 12

- a. i) Write a note on aminosugar.
ii) Draw the structure of Disparlure.
- b. Give the synthesis of Grandisol from 2-methyl-1, 3-butadiene.
- c. How glycerol is derived from oils and fats?
- d. What are the Insect Growth Regulators? Give structure of JH3.
- e. How many signals you expect in the proton decoupled ^{13}C -spectra of following compounds?
i) *o*-Dichlorobenzene ii) Methyl acetate iii) Acetone
- f. A compound gives following ^1H NMR spectra by using operating frequency 200 MHz. Coupling constant is 8 Hz.

^1H NMR δ (ppm): 3.9, 3.2

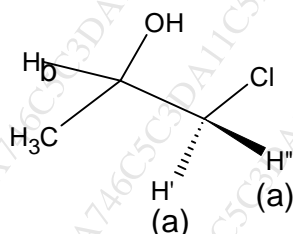
Calculate the frequency difference between these two signals and state whether the spectra is of first order or second order.

- g. Sketch and explain HETCOR spectrum of 1-Chloro-2-propanone.
- h. i) Identify the spectral technique that gives the signal for carbon bonded to only one hydrogen.
 - a) DEPT 135
 - b) DEPT 90
 - c) ^{13}C NMR
 - d) ^{19}F NMR



ii) In the COSY spectrum of _____ H_2 proton is coupled by a cross peak to _____ protons.

- H_4, H_5
- H_5, H_6
- H_4, H_6
- H_4, H_5 and H_6



iii) In the compound _____ the methyl doublet of 1H NMR at 1.2δ ppm correlates ^{13}C NMR signal at δ _____ ppm in its HETCOR spectrum.

- 20
- 67
- 51
- 51 and 67