



MBS-003-1104001

Seat No. \_\_\_\_\_

M. Sc. (Sem. IV) (CBCS) Examination

April / May- 2018

C-401 : Chemistry

(Advance Spectroscopic Technique) (New Course)

(All Branches)

Faculty Code : 003

Subject Code : 1104001

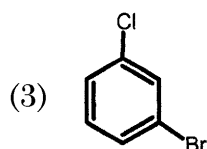
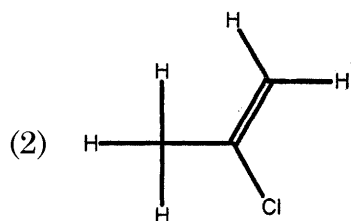
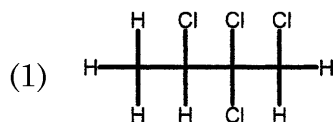
Time :  $2\frac{1}{2}$  Hours]

[Total Marks : 70

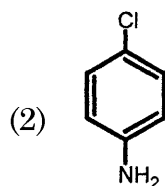
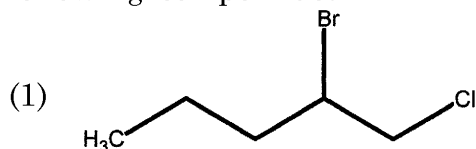
- Instructions :** (1) All questions carry equal marks.  
(2) All questions are compulsory.

1 Answer the following : (any seven) 14

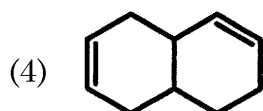
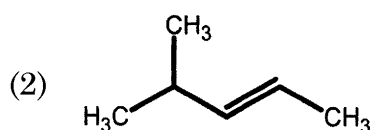
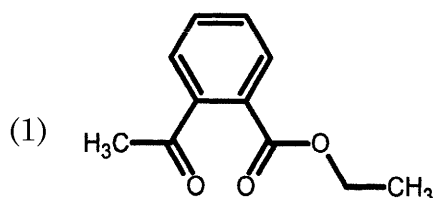
- (a) Determine equivalent and non equivalent hydrogen atoms in the following compounds :



- (b) How many different types of protons are there in following compounds?



- (c) Write the frequency range for Near Infrared spectroscopy.
- (d) Write the limitation of ESR.
- (e) Write the full form of HMQC, NOESY, TOCSY and DEPT.
- (f) Predict the  $^{13}\text{C}$ NMR signals for the following compounds :



- (g) What is chemical ionization? Explain primary ions, secondary ions and proton donation.
- (h) Write the principle of Raman spectroscopy.
- (i) Discuss types of UV absorption Shifts.
- (j) An organic compound X is composed of carbon, hydrogen and nitrogen with carbon constituting over 60% of the mass. It shows a molecular ion at  $m/z=112$  amu in mass spectrum. Write a possible molecular formula and show many ring plus double bond in it?

2 Answer the followings : (Any two)

14

- (a) What are mass analyzers? Explain TOF with diagram and discuss its merits and demerits.
- (b) Explain hyper fine splitting in ESR.
- (c) Compare the components of Middle and NIR instruments.

3 Answer the following : 14

- (a) Draw the hypothetical  $^1\text{H}$ NMR spectrum of 2,2-dimethylbutane and assign the multiplicity of each signals.
- (b) Give a brief account on different  $^2\text{D}$ NMR techniques.

OR

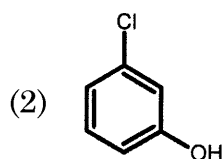
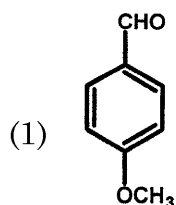
- 3 (a) Sketch the  $^1\text{H}$ NMR of 3,4-dimethylpentane -2-one and assign the multiplicity of each signals.
- (b) Explain COSY<sup>2</sup> DNMR techniques with suitable example.

4 Answer the following : (any three) 14

- (a) Discuss the UV absorption due to carbonyl compounds in details.
- (b) Discuss classical and quantum mechanical theory of Raman effects.
- (c) Draw the  $^1\text{H}$ NMR of AA'BB' system with suitable example and explain it briefly.
- (d) Discuss the application of Near Infrared Spectroscopy.

5 Answer the following : (any three) 14

- (a) Calculate the  $^{13}\text{C}$  chemical shift for the following Compounds:



(b) Answer the followings :

- (i) Define: Molecular ion peak and isotopic peak.  
(ii) Derive the structural formula for the compound  $C_6H_8O_3$  from mass spectral data :

%	22	20	33	82	18	100(B.P.)	34	45	4.1	0.4
m/e	63	64	65	92	93	120	121	152	153	154

- (c) Write a note on types of electronic transitions in UV spectroscopy.  
(d) Explain DEPT-  $135^\circ$   $^{13}C$ MR of Following compounds :

