



**NCD-003-028201** Seat No. \_\_\_\_\_

**P. G. D. S. A. I. T. (Sem. II) (CBCS) Examination**

**April / May - 2017**

**PGDI - 201 : Advance Spectroscopic & Thermal  
Methods of Analysis for Pharma &  
Chemical Products**

**Faculty Code : 003**

**Subject Code : 028201**

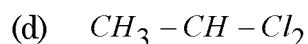
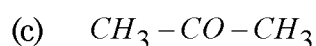
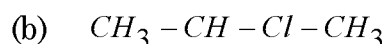
Time :  $2\frac{1}{2}$  Hours]

[Total Marks : 70

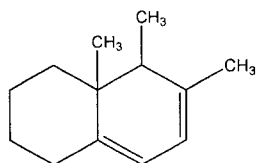
- Instructions :** (1) All questions are compulsory.  
(2) All questions carry equal marks.

**1 Answer the following questions : (Any Seven) 14**

- Give the principle of TGA and draw the TGA thermogram.
- Write the name of source of radiation used in IR, UV, NMR and Mass spectroscopy.
- Draw the hypothetical IR spectrum, give the various regions of it and explain fingerprint region.
- State the applications of Mass spectroscopy.
- Briefly explain Lambert's and Beer's law.
- Draw the hypothetical DSC curve and briefly explain.
- Indicate types of proton and number of signals in the following compounds :



(h) Calculate the  $\lambda_{\max}$  for given structure :



- (i) Write the full form of NOESY, COSY, HETCORE, HMBC.
- (j) Distinguish o-Chloro phenol and p-Chloro phenol by UV- Spectroscopy.

**2** Answer the following questions : (Any **Three**) **14**

- (a) Enlist the solvents used for the NMR scanning; discuss the merits and demerits of any one.
- (b) Draw the block diagram of UV spectrophotometer and discuss the functions of it.
- (c) Distinguish the following pairs of compounds for IR, Mass and NMR Spectroscopy.
- (1) Acetone and propanol
  - (2) Ethanol and dimethyl ether
- (d) Enlist the sample handle techniques in IR spectroscopy and give the advantage of each.

**3** Answer the following questions : **14**

- (a) The compound with molecular formula  $C_7H_9N$  shows the following spectral data :
- UV : 255 nm, Mass : 91, 30 and 107, IR : 3401, 3077, 2899, 1510, 1499, 1450;
- NMR : 7.26 (s,5H), 4.60(s,(Broad),2H), 3.86 (s,2H); derive the structure.
- (b) Calculate  $^{13}C$  chemical shift for each carbon of m-chloro phenol and p-chloro benzaldehyde.

**OR**

- 3 Answer the following questions : 14
- (a) Write note on types of transitions in UV spectroscopy
- (b) Draw the Mass spectrum, define molecular ion peak, base peak, rearrangement peak, metastable ion peak, Ring rule and Nitrogen rule.
- 4 Answer the following questions : (Any Two) 14
- (a) Draw the schematic diagram of NMR spectrophotometer and outline the function of each component.
- (b) Draw the schematic diagram of IR spectrophotometer and outline the function of each component.
- (c) Write a note on chemical shift and coupling constant, mention the applications of NMR spectroscopy.
- 5 Answer the following questions : (Any Two) 14
- (a) Sketch the NMR of 1-bromobutane and explain each peak with multiplicity.
- (b) Discuss the advantage of  $^{13}\text{C NMR}$  over  $^1\text{H NMR}$  and the application of  $^{13}\text{C NMR}$ .
- (c) Draw the schematic diagram of TGA and briefly discuss the functioning and discuss affecting factor.
- (d) The compound with molecular formula  $\text{C}_{10}\text{H}_{10}\text{O}$  shows the following NMR data:

$\delta$ Value	No. of Proton	Multiplicity	J value
7.75	3H	Singlet	
3.40	1H	Doublet	16.5
2.6	1H	Doublet	16.5
2.8	2H	Multiplets	
2.4	3H	Multiplets	

Derive the structure and predict their IR and Mass value.