

**FACULTY OF SCIENCE**  
**M. Sc I Semester Examination, January 2018**

**Subject : Chemistry**  
**Paper – IV : Analytical Techniques & Spectroscopy**

Time: 3 Hours

Max. Marks: 80

**PART-A (4x8=32 Marks)**

- 1 (a) Define partition ratio and retention time.  
 (b) Write note on Capacity factor & Selectivity factor.
- 2 (a) Explain Magnetic Resonance Imaging (MRI)  
 (b) What are chemically equivalent protons and Non-Equivalent protons in NMR?
- 3 (a) Define moment of inertia. Classify molecules based on moment of inertia giving examples.  
 (b) Taking the diatomic molecule, discuss the selection rules for IR-Spectroscopic technique.
- 4 (a) Define Chromophore and Auxochromes, with an example. Explain their absorption wave length ( $\lambda_{\max}$ )  
 (b) Define Beers law & discuss its application.

**PART-B (4x12=48 Marks)**

- 5 (a) Explain in detail about different Chromatographic techniques.  
 (b) Explain in detail about GC detectors.  

**OR**

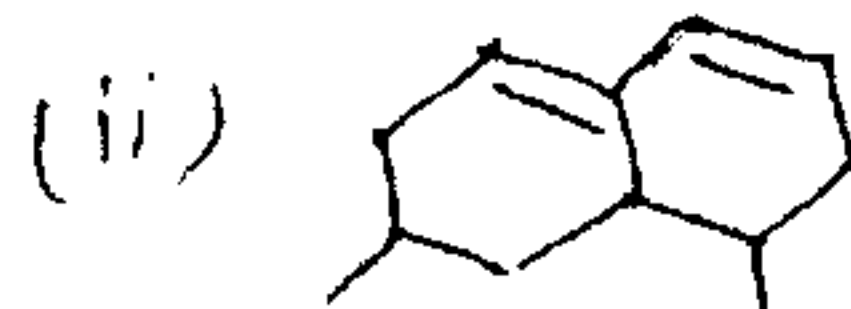
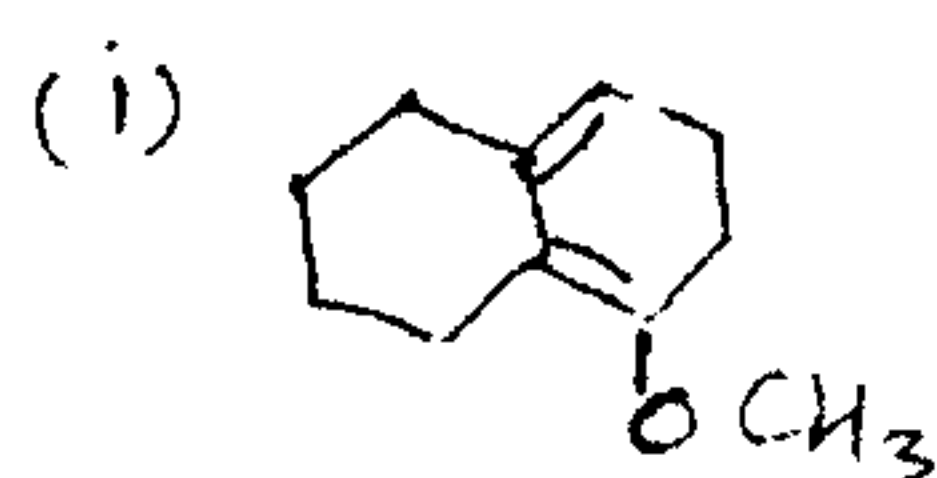
 (c) Explain principle and Instrumentation of HPLC.  
 (d) Write about applications & of HPLC.
- 6 (a) Explain principle of NMR spectroscopy.  
 (b) Write about various factors effecting chemical shifts in proton NMR.  

**OR**

 (c) Explain in detail about various types of spin-spin coupling  
 (d) Sketch NMR spectra of Paracetamol and Mesitylene.
- 7 (a) Explain calculation of bond length from rotational spectra of diatomic molecule.  
 (b) Calculate and comment on the change in rotational constant from  $^1\text{H}^{35}\text{Cl}$  to  $^1\text{H}^{37}\text{Cl}$ .  

**OR**

 (c) Explain IR spectra of metal coordinated  $\text{NO}_3^-$ ,  $\text{SO}_4^{2-}$  and  $\text{CO}_3^{2-}$  ions.  
 (d) Explain the Complimentary nature of IR and Raman Spectra.
- 8 (a) Explain Woodward Fieser rules.  
 (b) Calculate the  $\lambda_{\max}$  of the following

**OR**

- (c) Discuss the absorption spectra of charge transfer complexes.
- (d) Explain in detail about the absorption spectra of Cis-trans isomers and cross conjugated systems.

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