



**AF-3516**

M.Sc. (Final)  
Term End Examination, 2017-18

**CHEMISTRY**

Paper - I

Application of Spectroscopy, Photochemistry  
and Solid State Chemistry

*Time : Three Hours] [Maximum Marks : 100*  
*[Minimum Pass Marks : 36*

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**Note** : Answer any **five** questions. The figures in the right-hand margin indicate marks.

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1. (a) Explain symmetry and shape of  $AB_3$ ,  $AB_4$  and  $AB_5$  types of molecule. 6
- (b) Describe hyperfine interaction in ESR spectroscopy. 8
- (c) What is the significance of 'g' tensor ? 6
2. (a) Discuss the various factors which influences the vibrational frequencies of carbonyl group in IR spectroscopy. 6

(2)

(b) What is the effect of hybridisation of carbon on the stretching frequency of C—H bond in IR spectroscopy ? 6

(c) How will you differentiate the following pairs of compounds with the help of IR spectroscopy ? 8

(i) Primary alcohol and Secondary alcohol

(ii) Malic acid and Fumaric acid

3. (a) Illustrate chemical shift. Explain the various factors which are responsible for affecting the magnitude of chemical shift. 8

(b) Explain Karplus curve and give its applications. 6

(c) Discuss spin-spin interaction between two nuclei. 6

4. (a) Show the various electronic transitions taking place when cinnamaldehyde molecule absorbs UV radiations. 5

(b) How cis and trans stilbene can be distinguished by UV spectroscopy. 5

(c) Explain the term optical rotatory dispersion (ORD) and circular dichroism (CD). 5

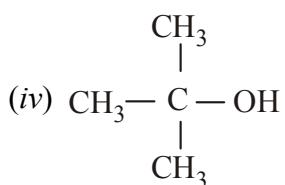
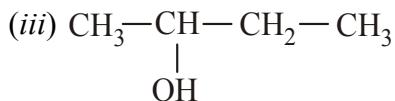
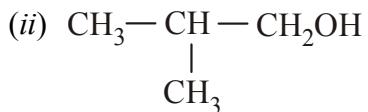
(d) Discuss the effect of solvent polarity on  $\pi-\pi^*$  transition and  $n-\pi^*$  transitions. 5

(3)

5. (a) Write notes on any **two** of the following :  $5 \times 2$

- (i) McLafferty Rearrangement
- (ii) Mass spectral fragmentation of branched chain hydrocarbon
- (iii) Biological applications of Mossbauer spectroscopy

(b) Identify the following isomeric alcohol : 5



(c) Explain COSY and NOESY techniques. 5

6. (a) What is the fate of excited molecule ? 8

(b) Describe the different types of photochemical reactions. Explain photodissociation reaction with suitable examples. 8

(c) What is photosensitization reaction ? 4

(4)

7. Write notes on any **four** of the following :  $5 \times 4$

- (a) Photo-Fries rearrangement
- (b) Barton reaction
- (c) Cyclohexadienone rearrangement
- (d) Oxetane formation
- (e) Quantum yield
- (f) Photoisomerization of benzene

8. (a) Give detailed account on photochemical cis-trans isomerization 10

(b) Discuss the photochemistry of saturated cyclic ketones. 10

9. (a) Discuss the kinetics of solid state reaction. 6

(b) What do you mean by point defects, line defects and plane defects ? 6

(c) Explain superconductivity. Give the uses of organic superconductors. 8

10. (a) On the basis of Band theory differentiate among conductor, semi-conductor and insulator. 10

(b) How Ferromagnetic properties originated in substances ? 5

(c) Write a note on photoelectric effect. 5