

# AE-760

M. Sc. (Final)

Term End Examination, 2016-17

# CHEMISTRY

# Paper - I

# Application of Spectroscopy, Photochemistry and Solid State Chemistry

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

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

1. (a) Explain the characteristic vibrational frequencies of alkanes, alkenes and alkynes. 10
- (b) How will you differentiate between different types of hydrogen bonding by IR spectroscopy? 6
- (c) How is the presence of anhydride group identified by IR spectroscopy? 4

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|----|------|---|----|
| 2. | (a)  | Explain methods of the simplification of complex NMR spectra.   | 10 |
|    | (b)  | Explain COSY, NOESY, APT and DEPT techniques.   | 10 |
| 3. | (a)  | Discuss the applications of resonance Raman Spectroscopy.   | 6  |
|    | (b)  | Explain the following :   | 14 |
|    | (i)  | Hyperfine coupling  |    |
|    | (ii) | Significance of g-tensors   |    |
| 4. | (a)  | Explain the principle and instrumentation of mass spectroscopy.   | 10 |
|    | (b)  | Explain the factors affecting fragmentation.  | 5  |
|    | (c)  | What are metastable peaks ?   | 5  |
| 5. | (a)  | How can you calculate $\lambda_{\text{max}}$ value of conjugated dienes and conjugated carbonyl compounds by Fieser-Woodward rule ? | 8  |
|    | (b)  | Explain the various electronic transitions which take place between 185-800 nm.   | 8  |
|    | (c)  | Explain Beer-Lambert law.   | 4  |
| 6. | (a)  | Write note on circular dichroism and its applications.  | 8  |

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- (b) Explain following : 12
- (i) Nuclear magnetic double resonance
  - (ii) Fourier transform technique
7. (a) Discuss types of photochemical reaction.  
Derive equation for rate constant of any  
one photochemical reaction. 8
- (b) Explain following photochemical  
reactions of aromatic compounds : 12
- (i) Isomerisation
  - (ii) Addition reaction
  - (iii) Substitution reaction
8. (a) Explain following photochemical  
reactions of carbonyl compounds : 12
- (i) Norrish type I reaction
  - (ii) Norrish type II reaction
  - (iii) Oxetane formation
- (b) Discuss the photochemistry of vision and  
formation of photochemical smog. 8
9. (a) How will you differentiate among metal,  
insulators and semiconductors ? 4
- (b) Explain p-n junction. 10
- (c) Write a note on point defects. 6

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10. Explain the following : 20

- (a) Optical properties of solids
  - (b) Organic charge transfer complex
  - (c) Thermodynamics of Frankel defect
  - (d) Colour centers
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