

- (iii)  $MH_n$  radicals with  $n = 0, 1, 2$  and  $3$   
(M has zero nuclear spin)

### Unit III

5. (a) Considering the relative isotopic abundance of halogens, predict the appearance of molecular ion peak in the mass spectra of the following :
- (i)  $ZnCl_2$
  - (ii)  $AlCl_3$
  - (iii)  $CHClBr_3$
  - (iv)  $CH_2Br_2$  **2.5×4=10**
- (b) Briefly describe the following peaks observed in Mass spectrometry :
- (i) Molecular ion peak
  - (ii) Base peak
  - (iii) Metastable ion peak
  - (iv) Mc-Lafferty peak
6. (a) Explain the principle of MB spectroscopy. Discuss the various conditions required for the recording to the spectra. **7**

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## CC-291

### M. Sc. EXAMINATION, May 2017

(Third Semester)

(Re-appear Only)

CHEMISTRY

CH-601-B

Inorganic Special-I (Spectroscopic Techniques)

*Time : 3 Hours*

*[Maximum Marks : 100]*

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Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

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**Note :** Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

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P.T.O.

## Unit I

1. (a) Discuss the various types of interferences encountered in Atomic Absorption Spectroscopy. How can these interferences be minimized/eliminated ?  
12
- (b) Using appropriate diagram, discuss the lamp and burners used in AAS. 8
2. (a) What is Atomic Emission Spectroscopy ? Discuss the principle and instrumentation involved in this technique. How is this spectroscopy better in comparison to AAS ? Also give any *three* disadvantages.  
15
- (b) Discuss Inductively Coupled Plasma (ICP) in brief. 5

## Unit II

3. (a) Explain the principle of Electron Spin Resonance Spectroscopy. Explain the recording of EPR spectra in derivative form. 8

- (b) What is Lande splitting factor “g” in EPR ? Derive its value for a free electron. Give the various factors that affect its value. 6
- (c) What is “Zero Field Splitting” ? How does its magnitude affect the EPR spectra of ions having more than one unpaired electrons ? Also define Kramer's degeneracy. 6
4. (a) The EPR spectra of Cu(II)-bis(salicyladimine) complex comprises of 4 main groups of lines each having 11 peaks with relative intensity ratio of 1:2:3:4:5:6:5:4:3:2:1. Explain this observation on the basis of hyperfine splitting. 7
- (b) Discuss any *two* application of EPR spectroscopy in inorganic chemistry. 3
- (c) Predict the EPR spectra (number of signals and relative intensity pattern) of the following species : 2+2+6=10
  - (i)  $\text{Cu}^{2+}$  ion ( $I = 3/2$ );
  - (ii)  $[\text{NO}(\text{SO}_3)_2]^{2-}$  ion;

- (b) What is "Isomer shift" ? Give the various factors affecting its value. **5**
- (c) Using any *two* examples, explain the quadrupole splitting phenomenon in MB spectroscopy. **5**
- (d) Write a short note on FAB used in Mass spectrometry. **3**

#### Unit IV

- 7. (a) Discuss Frank-Condon principle to explain the vibrational structure of electronic spectra. **10**
- (b) Give the principle and instrumentation used in UV-visible spectroscopy. **10**
- 8. Briefly discuss the following : **5×4=20**
  - (i) Phenomenon of Fluorescence and Phosphorescence
  - (ii) Bathochromic Shift in UV-vis spectra
  - (iii) Effect of conjugation on UV-V is spectra.
  - (iv) Various types of Electronic transitions possible on acetone molecule.

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- (b) What is "Isomer shift" ? Give the various factors affecting its value. **5**
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