

FACULTY OF SCIENCE

M.Sc. II-Semester Examination, May / June 2018

Subject : Chemistry

Paper - IV

Analytical Techniques and Spectroscopy-II

Time : 3 hours

Max. Marks : 80

Note : Answer all questions from Part-A and Part-B. Each question carries 8 marks in Part-A and 12 marks in Part-B.

PART – A (4 x 8 = 32 Marks)
(Short Answer Type)

- 1 a) Write a brief note on Pulse polarography.
b) What is the principle involved in thermogravimetry?
- 2 a) Sketch the ^{19}F -nmr spectrum of $\text{CF}_3\text{CH}_2\text{OH}$ and explain the splitting pattern.
b) What is the principle involved in Magic angle spinning?
- 3 a) Write a note on orthoeffect.
b) Write a short note on Fast atom bombardment (FAB).
- 4 a) State Koopman's theorem.
b) The hyperfine coupling constant(a) of methyl radical is 2.3mT. Calculate the electron density at H of methyl radical ($R=0.05\text{T}$).

PART – B (4 x 12 = 48 Marks)
(Essay Answer Type)

- 5 a) An amperometric titration of Zn^{2+} ions carried out using potassium ferricyanide. Explain the type of graph obtained for this titration.
b) Draw a typical polarogram, label the axis, and show half wave potential and residual current.

OR

- c) Explain the principles and applications of Differential scanning calorimetry.
 - d) Explain how polarography is useful in the qualitative and quantitative analysis of metal ions.
- 6 a) How enantiomers can be discriminated by ^1H NMR? Discuss any two methods.
b) Explain the conversion of non first order spectra to first order spectra by increased field strength and Lanthanide shift reagents.

OR

- c) Sketch the ^{19}F and ^{31}P NMR of PF_5 and explain the splitting pattern.
- d) Write a note on (i) NOE (ii) AMX spectra.

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7 a) A ketone, C_4H_8O , gave peaks at m/Z 72, 57, 43, 29. Identify the compound and account the fragmentation pattern.

b) Explain the following :

i) Nitrogen Rule ii) β -Cleavage

OR

c) Write the principle involved in Secondary Ion Mass Spectrometry (SIMS).

d) What is the principle involved in chemical ionization method.

8 a) Sketch the photoelectron spectrum of N_2 molecule and explain it.

b) What is zero field splitting and Kramer's Degeneracy.

OR

c) What are the principles of Auger electron spectroscopy? Discuss.

d) Explain the ESR spectrum of bisacetylaldimine $cu(II)$ complex.

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