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**CH/AC/OC/CAS 404**

**First Semester M.Sc. Degree Examination, December 2018**  
**Chemistry/Applied Chemistry/Organic Chemistry/Analytical Chemistry**  
**(CBCS : 2016-17 Syllabus)**

**INORGANIC SPECTROSCOPY AND ANALYTICAL TECHNIQUES**

Time : 3 Hours

Max. Marks : 70

- Note :** i) Answer Part – A and **any four** questions from Part – B.  
ii) Figures to the **right** indicate marks.

**PART – A**

1. Answer the following questions : **(9×2=18)**
- a) What is Zeeman effect and write the fundamental equation governing the EPR spectroscopy.
  - b) How do you distinguish NQR from NMR ? Define 'EFG' in NQR.
  - c) Give the basic principle of X-ray photoelectron spectroscopy.
  - d) Define the term 'ion-exchange capacity' and name the commercially available cation and anion exchange resins.
  - e) What is procedural decomposition temperature ?
  - f) Sketch the TG and DTA curves for decomposition of  $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$ .
  - g) Sketch Hollow cathode lamp used in AAS. Write its advantages.
  - h) Write the limitations of flame photometry.
  - i) What is the principle of light scattering method to determine the particle size ?

**PART – B**

- Answer **any four full** following questions : **(4×13=52)**
2. a) Discuss the hyperfine splitting in EPR taking methyl radical ( $\text{CH}_3\cdot$ ) as an example.
- b) Explain the basic principle and measurement technique involved in Mossbauer spectroscopy.
- c) Explain basics of NQR spectroscopy. **(5+4+4=13)**

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3. a) Elaborate on the quadrupolar splitting and magnetic splitting in Mossbauer spectra.  
b) Discuss the zero-field splitting and Kramer's degeneracy in EPR.  
c) Explain the instrumentation of X-ray photoelectron spectroscopy and sketch the spectra for any metal oxide sample. **(5+4+4=13)**
4. a) Give the synthesis of cation and anion exchange resins. Explain the basic features of ion-exchange reactions.  
b) Explain the DSC curve of a crystalline polymer.  
c) What are the applications of DTA technique ? **(5+4+4=13)**
5. a) Discuss the principle and instrumentation TGA.  
b) What is resin selectivity ? Explain the separation of lanthanides using ion exchanges.  
c) Discuss the theory of gel permeation chromatography and mention the factors governing the column efficiency. **(5+4+4=13)**
6. a) Discuss the theory, principle and working of AAS.  
b) Explain the analysis of metal ions by flame photometry.  
c) What is fluorescence quenching ? Explain the working of fluorimeter. **(5+4+4=13)**
7. a) Differentiate between Nephelometry and Turbidimetry.  
b) Explain the principle and working of flame emission spectroscopy.  
c) Discuss the interference in AAS. **(5+4+4=13)**
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