First Year M.Sc. Degree Examination
August 2009
(Freshers)

DEC:APP:CHEM:1.01 - ANALYTICAL AND SPECTROSCOPIC TECHNIQUES

Time : 3 Hours Max. Marks : 85

Note : 1. Answer Part-A, any three from Part-B and Part-C.
2. Figures to the right indicate marks.

PART-A

1. Answer any ELEVEN questions. **11x2=22**

a) Explain why N_2 is IR active where as NO is inactive.
b) Define the terms ion exchange capacity and masking agents.
c) What are the advantages and limitations of paper chromatography?
d) How many H^1 NMR signals would expect for $CH_3CH_2CH_3$?
e) What is fluorescence quenching?
f) Differentiate relative error and absolute error.
g) What is base peak in mass spectroscopy?
h) Define red shift and blue shift.
i) State Beer-Lambert's law and give the mathematical relation.
j) What is the principle of HPLC?
k) Write the selection rule of ESR?
l) What is $g_{\parallel}$ and $g_{\perp}$ in ESR spectroscopy?
m) Define precession and accuracy.
n) What is eddy diffusion? What is its effect?
o) Define Force constant.

PART-B

Answer any THREE questions. **3x8=24**

2. a) Discuss the different types of atomizers used in AAS and merits and demerits in each type.
b) Explain Zero splitting and Karmmer's degeneracy in ESR spectroscopy. **4+4**

3. a) Discuss the principle and instrumentation of fluorescence spectroscopy.
b) What is chemical shift? Discuss the factors influencing the chemical shift. **4+4**

4. a) Explain the different steps followed in rounding off a numerical value.
   b) What are the methods for minimizing determinate errors in analytical estimations. **4+4**

5. a) Explain the working principle of FID with a neat diagram.
   b) Compare plate theory and Rate theory in chromatography. **4+4**

PART-C

Answer any THREE questions. **3x13=39**

6. a) Discuss the superiority of TLC over other chromatographic techniques.
   b) Briefly explain the various factors affecting the position of UV -bands.
   c) Discuss the basic principle of ion exchange chromatography. **5+5+3**

7. a) Explain the theory of spin-spin splitting in NMR.
   b) Discuss the different types of molecular vibrations.
   c) Write a note on the factors affecting TG curve? **5+5+3**

8. a) Draw a neat sketch of double beam IR spectroscope and explain the function of each component.
   b) Give a brief note on interaction of electromagnetic radiation with matter.
   c) Describe the usefulness of IR spectroscopy in the study of molecules with suitable example. **5+5+3**

9. a) What is hyperfine splitting in ESR spectroscopy to predict the number of signals for CH_3 CD_3? Explain the relative intensity in each case.
   b) Sketch the diagram of HPLC and explain the function of its components and operation. **7+6**

10. a) Describe the experimental set up involved in paper chromatography in qualitative analysis.
    b) Draw a neat diagram of gas chromatography and explain the functions of each component. **7+6**

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