CLASS: MSC/IMSC/PRE-PHD   SEMESTER : III/VII/NA
BRANCH: CHEMISTRY   SESSION : MO/18

SUBJECT: SAC2007-APPLICATIONS OF SPECTROSCOPY

TIME: 03:00   FULL MARKS: 60

INSTRUCTIONS:
1. The question paper contains 7 questions each of 12 marks and total 84 marks.
2. Candidates may attempt any 5 questions maximum of 60 marks.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q.1(a) With the help of a neat diagram explain the working of Quadrapole mass analyzer. What are the [6]
disadvantages of electron ionization (EI) type molecular ion generator?

(b) Discuss isotope effect with example. Compare and contrast – molecular ion, protonated molecular ion [6]
and metastable ion.

Q.2(a) Discuss the mass spectrum of cycloalkanes. Why the molecular ions in case of cycloalkanes are more [6]
stable than those in case of alkanes?

(b) Discuss the fragmentation that takes place during the mass spectroscopy of alkyl halides. State [6]
Stevenson's rule and explain with an example.

Q.3(a) Predict the epr spectrum of $\cdot CD_3$, $\cdot^{13}CD_3$, $\cdot CH_2D$ radicals. [6]

(b) How many esr transitions are expected for Mn^{+2} in weak and strong tetragonal fields? Describe the [6]
transitions with diagram.

Q.4(a) How does isotopic substitution affect the vibrational frequency? Discuss with examples. [6]

(b) Discuss the principle of Raman spectroscopy. [6]

Q.5(a) Proof that J=4E for ^1H spin-spin splitting with proper diagram. [6]

(b) What do you mean by first order and second order spectra? Write the principle of NOESY spectroscopy. [6]

Q.6(a) Describe the principle of ^1H NMR spectroscopy and hence compare it with ^{13}C NMR. [6]

(b) Predict the right structure with proper explanations from following data; [6]
Molecular formula: $C_7H_{11}NO$
^1H NMR: 9.5 (s, 1H), 2.5 and 1.9 (2 sets of triplet, 4H), 1.2 (s, 6H).
^{13}C NMR: 205 (d), 120 (s), 45 (s), 32, (t), 21 (q), 12 (t).

Q.7(a) Outline the working principle of an ion trap analyzer. [4]

(b) Write short note on Anharmonic oscillator. [4]

(c) Write short note on broad band decoupling in ^{13}C NMR spectra [4]

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