

OR

How can P-31 be used to elucidate the mechanism of reactions?

9. How can P-31 be used to distinguish:

- (a) Between phosphorus and hypophosphorus acids.
- (b) Between $FP(O)(OH)_2$ and $F_2P(O)OH$.

10. Discuss in detail the applications of infrared spectroscopy to inorganic compounds.

72054-1,550-(P-4)(Q-10) (15) (4)

Roll No.

72054

M. Sc. Chemistry 1st Semester (for Other
Affiliated Colleges Except UTD)
Examination – December, 2015

GENERAL SPECTROSCOPY

Paper : Ch-404

Time : Three Hours] [Maximum Marks : 60

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

Note: Question no. 1 is compulsory and all its parts must be attempted in sequence. Further, attempt at least one questions from each section but a total of five questions including the compulsory questions. All questions carry equal marks.

1. Compulsory Questions :

- (i) Unlike a bar magnet, the magnetic moment of a nucleus does not orient itself with the direction of the applied field, B_0 , irrespective of its strength. Why?

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- (ii) What is the decreasing order of chemical shifts for the methyl derivatives of Zn, Mg, Hg and Cd ? Why ?
- (iii) At what position, do the ortho, meta and para protons in trimethyl anilinium cation absorb and why ?
- (iv) At what chemical shifts do the protons in isopropyl carbocation absorb and why ?
- (v) Why does Buckminster fullerene (C_{60}) show only four absorption bands in its i. r. spectrum ?
- (vi) Why are the peaks in UV spectrum broad ?
- (vii) Where do the inner and outer meso protons of porphyrins generally absorb in PMR spectra and why ?
- (viii) Show the orientations of N-14 in an applied magnetic field.

SECTION - A

2. What is Frank-Condon principle ? Explain the vibrational course structure of electronic band.
3. What are molecular vibrations ? Discuss the various factors in details which affect vibrational frequencies in polyatomic molecules.

72054-1,550-(P-4)(Q-10) (15) (2)

4. Explain Transition probability and transition moment of spectral lines.

SECTION - B

5. Discuss in details the modern quantum concept of NMR spectroscopy.
6. Explain the following :
- (i) While the cyclopentadienyl protons resonate at δ 5.37, the tropylium cation protons absorb at δ 9.17. Why ?
- (ii) Where do the protons in allyl carbocation absorb and why ?
- (iii) Sketch and explain the PMR spectrum of phenylacetic acid.
- (iv) Explain the two types of shifts in NMR.

7. Explain in detail the principle of infrared spectroscopy in organic chemistry.

SECTION - C

8. NMR can be used to study fluxional inorganic molecules. Illustrate.

72054-1,550-(P-4)(Q-10) (15) (3)

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