

Roll No.

Total Pages : 5

1784/M

M-35/2051

INORGANIC SPECTROSCOPY-II

Paper-413

Semester-IV

Time allowed : 3 Hours] [Maximum Marks : 55

Note: The candidates are required to attempt two questions each from sections A carrying 8 marks and B carrying 8½ marks each. Section C consisting of 11 short answer type questions carrying 2 marks each.

SECTION-A

1. (a) Explain the importance of deuterated solvents, with appropriate examples, in ^1H NMR spectroscopy. 4
- (b) Predict the ^{31}P NMR spectrum of HPF_2 , considering the following two possibilities:

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[P.T.O.

(i) $J_{\text{P-F}} > J_{\text{P-H}}$

(ii) $J_{\text{P-F}} < J_{\text{P-H}}$.

4

2. (a) Explain the followings in detail in NMR spectroscopy:

(i) mechanism of electron shielding

(ii) interatomic ring currents. 4

- (b) What do you understand by chemical shift in NMR spectroscopy? How the same will be effected when local diamagnetic terms does not predominate, explain? 4

3. (a) Explain the effect of quadrupolar moment in NMR spectroscopy. 4

(b) How will you determine the exchange reactions between metal ion and ligands with the help of NMR spectroscopy? 4

4. (a) With the help of suitable example, elaborate the NMR spectra of a paramagnetic transition metal a complex.

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2

How it will differ from a typical NMR of a diamagnetic molecule? 4

- (b) What do you understand by isotropic contact shifts and pseudo contact shift, explain with appropriate examples? 4

SECTION-B

5. (a) Explain the EPR spectrum of methyl free radical and benzene free radicals. 4
- (b) Discuss the influence of a quadrupolar nucleus on the EPR spectrum of a compound. 4½
6. (a) With the help of appropriate diagram and mathematical equations, explain the origin of the EPR signals. 4
- (b) Explain the hyperfine splitting in EPR spectroscopy by using the appropriate example. 4½

7. (a) What do you understand by finger printing in mass spectrometry? Elaborate its application. 4
- (b) Give an account of the various ionization techniques used in mass spectroscopy. 4½
8. (a) Give the basic principle used in ORD and CD spectroscopy. 4
- (b) Discuss in detail the practical application of ORD and CD techniques in inorganic chemistry. 4½

SECTION-C

9. (i) Draw the line diagram of NMR spectrometer.
- (ii) Draw the qualitative proton NMR spectra of ethanol in the following solvents:
(a) CDCl_3 (b) D_2O .
- (iii) Draw the proton decoupled ^{19}F NMR spectra for CH_2F_2 .

- (iv) Write the importance of hyperfine splitting constant in EPR spectroscopy.
- (v) Explain the effect of isotopic abundance on mass spectrum of a molecule.
- (vi) What do you understand by zero field splitting, explain?
- (vii) What do you understand by base peak and molecular ion peak in mass spectrometry?
- (viii) Give the line diagram of the CD spectrophotometer.
- (ix) Discuss the spin-spin relaxation in NMR spectroscopy.
- (x) With the help of suitable examples explain spin-spin coupling mechanism in NMR spectroscopy.
- (xi) What factors could affect the line widths in EPR spectroscopy.

11×2 = 22