

July 2014

M. Sc. IInd Semester Examination

CHEMISTRY

Paper IX (IV) Spectroscopy - II and Diffraction Methods (MCH-409) (IX)

Time 3 Hours

(Max. Marks : Regular 85 / Private 100 / Old ATKT 35)

Note : This question paper is meant for all Regular, Private and Old ATKT students. Answer all five questions. All questions carry equal marks. The blind candidates will be given 60 minutes extra time.

1. (a) Describe the principle of 'nuclear magnetic resonance' spectroscopy. Why do neighboring protons split into a triplet and three neighboring protons split a signal into a quartet ?
(b) Explain the salient features of ^{13}C NMR spectroscopy.

OR

- (a) Derive the relation for chemical shift. Present an account of the various factors affecting the magnitude of the chemical shift.
(b) Outline the features of 'Fourier transfer NMR' and its advantages.
2. Describe the basic principle of 'Nuclear Quadrupole Resonance' spectroscopy along with the experimental aspects for NQR measurements.

OR

Give descriptive account of Quadrupole nuclei and splitting in context of NQR spectroscopy. Give some important applications of the technique.

3. (a) Explain the mechanism of hyperfine interaction in the ESR spectra of organic radicals.
(b) Calculate the 'g' value if the methyl radical shows ESR at 3290 gauss (0.3290 T) in the spectrometer operating at 9230 MHz.

(Given : $h = 6.62 \times 10^{-34}$ JS ; $\beta = 9.274 \times 10^{-24}$ JT $^{-1}$)

OR

Discuss the salient features of 'electron Spin Resonance (ESR)' spectroscopy along with its some important applications.

4. (a) Illustrate various steps used to assign the Miller Indices.
(b) The first order reflection of beam of X-Rays of wavelength 1.5 Å from the (100) plane of a crystal of the simple cubic type occurs at an angle of 11.29°. Calculate the length of the unit cell.

(Given : $\sin 11.29^\circ = 0.1991$)

OR

(a) Describe 'Debye Scherrer Method' for X-Ray structural analysis of crystals.

(b) Draw shaded planes for (100), (110) and (111) planes.

Illustrate various advantages of 'electron diffraction method'. Discuss briefly some important requirements of a specimen to be suitable for measurement.

OR

Explain the features of 'Neutron Diffraction' technique. Illustrate some significant applications of neutron diffraction method.