

DEVI AHILYA VISHWAVIDYALAYA, INDORE

M.Sc. CHEMISTRY (SEMESTER – II)

Paper No.

: IV (Code- MCH - 409)

Compulsory /Optional

: Compulsory

Max. Marks

: 100

Paper – IV : Spectroscopy II & Diffraction Methods

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| Unit – I | Nuclear Magnetic Resonance Spectroscopy Nuclear spin, nuclear resonance, saturation, shielding of magnetic nuclei, chemical shift and its measurements, factors influencing chemical shift, deshielding, spin-spin interactions, factors influencing coupling constant "J" Classification (AXB, AMX, ABC, A ₂ B ₂ etc.). Spin decoupling; basic ideas about instrument, NMR studies of nuclei other than proton- ¹³ C, ¹⁹ F and ³¹ P. FT NMR, advantages of FT NMR. |
| Unit – II | Nuclear Quadrupole Resonance Spectroscopy Quadrupole nuclei, quadrupole moments, electric field gradient, coupling constant, splitting. Applications. |
| Unit – III | Electron Spin Resonance Spectroscopy Basic principles, zero field splitting and Kramer's degeneracy, factors affecting the 'g' value. Isotropic and anisotropic hyperfine coupling constants, spin Hamiltonian, spin densities and Mc Connell relationship, measurement techniques, applications. |
| Unit – IV | X-ray Diffraction Bragg condition, Miller indices, Laue Method, Bragg method, Debye Scherer method of X-ray structural analysis of crystals, index reflections, identification of unit cells from systematic absences in diffraction pattern, Structure of simple lattices and X-ray intensities, structure factor and its relation to intensity and electron density, phase problem. Description of the procedure for an X-ray structure analysis, absolute configuration of molecules. |
| Unit – V | Electron Diffraction Scattering intensity vs. scattering angle, Wierl equation, measurement technique, elucidation of structure of simple gas phase molecules. Low energy electron diffraction and structure of surfaces. Neutron Diffraction Scattering of neutrons by solids measurement techniques, Elucidation of structure of magnetically ordered unit cells. |

Books suggested:

1. Modern Spectroscopy, J.M. Hollas, John Wiley.
2. Applied Electron Spectroscopy for chemical analysis d. H. Windawi and F.L. Ho, Wiley Inter science.
3. NMR, NQR, EPR and Mossbauer Spectroscopy in Inorganic Chemistry, R.V. Parish, Ellis Harwood.
4. Physical Methods in Chemistry, R.S. Drago, Saunders College.
5. Chemical Applications of Group Theory, F.A. Cotton.
6. Introduction to Molecular Spectroscopy, G.M. Barrow, Mc Graw Hill.
7. Basic Principles of Spectroscopy, R. Chang, Mc Graw Hill.
8. Theory and Application of UV Spectroscopy, H.H. Jaffe and M. Orchin, IBH- Oxford.
9. Introduction to Photoelectron Spectroscopy, P.K. Ghosh, John Wiley.
10. Introduction to Magnetic Resonance. A Carrington and A.D. Maclachalan, Harper & Row.