Subject Code : P8BI8

CC – VIII EXPERIMENTAL TECHNIQUES FOR BIOMOLECULES

UNIT – I

Isolation and purification of proteins - Crystallization of protein – Crystal Structure – Bravais Lattice – Symmetry elements and operations – Point groups – Space groups – Bragg's law – X-ray diffraction - Proteins structure determination by X-ray diffraction - Phase determination - Calculation of electron density map - Interpretation of electron density map - Refinement of the structures - Electron crystallography of proteins – High throughput techniques in Crystallography

UNIT – II

Electronic energy levels – electronic transitions – selection rules – types of spectra – IR, UV – visible spectroscopy - Measurement of Infrared (IR) spectrum – Theory of IR spectroscopy – IR spectra of polyatomic molecules – biological examples – Theory of UV - visible spectroscopy – application of UV spectra to proteins – measurement of molecular dynamics by fluorescence spectroscopy

UNIT – III

The principle of Nuclear Spin – Spin flipping – theory of Nuclear Magnetic Resonance – spectral parameters in NMR – intensity, chemical shift, spin-spin coupling, relaxation times, line widths, nuclear Overhauser effect (NOE), chemical exchange, paramagnetic centers – application of NMR in biomolecular structure determination.

UNIT – IV

Principles of electrophoresis – SDS PAGE – Molecular weight determination of proteins - 2D-gel electrophoresis – capillary electrophoresis - principles of chromatography – Gel & ion exchange chromatography – applications

UNIT – V

Micro array techniques and their applications in biology - Mass spectroscopy - ESI and MALDI-TOF - protein finger printing.

References Books

1. W. Kemp, organic spectroscopy, 3rd edition, ELBS, McMillan, London, 1991.
2. C.N. Banwell and E.M.McCash, fundamentals of molecular spectroscopy, 4th edition, Tata McGraw Hill, New Delhi, 1995.
3. I.Howe, D.H.Williams and R.D.Bowen, Mass Spectrometry, principles and applications, 2nd edition, McGraw Hill, London, 1981.
4. Mass Spectroscopy for Biotechnology by Gary Siuzdak, Academic Press, 1995.
5. Basic HPLC and CE of Biomolecules by Cunico, Gooding and Wehr, Bay Bioanalytical Lab, 1998.
6. Van Holde, Principles of Physical Biochemistry by Van Holde, Prentice Hall, 2000.
7. Helen C. Causton, John Quackenbush and Alvis Brazma, A Beginner's Guide: Microarray Gene Expression Data Analysis, Blackwell Publishing, USA, First Indian Reprint, 2004.
8. Vasantha Pattabhi and N. Gautham, Biophysics, Narosa Publishing House, New Delhi, 2002.