

MB-104: BIOINSTRUMENTATION (Four Credits)

(ELECTIVE)

Unit I: Laboratory techniques (10)

Biosafety in microbiological laboratories: General safety measures, Personal protection, Chemical and Biological hazards, Spillage and Waste disposal, First aid.

Theory, Principle, Working and Applications of: pH meter and Laminar Air Flow.

Efficacy testing protocols for Autoclave, pH meter and Laminar Air Flow.

Centrifuge machine types and Centrifugation: Differential, Rate zonal, Isopycnic, Density gradient, Rotor types and Ultra centrifugation.

Unit II: Chromatography Techniques (12)

Theory, Principle, Apparatus, Methods and Applications of Paper Chromatography, TLC, HPTLC, Gel Filtration Chromatography, Ion Exchange Chromatography, Affinity Chromatography, Gas Chromatography, and HPLC.

Unit III: Electrophoretic Techniques (11)

Theory, Principle, Apparatus, Methods and Applications of Paper Electrophoresis, Poly Acrylamide Gel Electrophoresis (PAGE), Agarose Gel Electrophoresis.

Principle and Applications of: Iso-electric Focusing, Immuno Electrophoresis, Enzyme-Linked Immunosorbant Assay (ELISA), Southern, Northern and Western Blotting.

Unit IV: Spectroscopic and Radio-isotopic Techniques (12)

Principle, Working, Instrumentation and Applications of: UV/Vis spectroscopy, IR spectroscopy, Atomic absorption spectroscopy, NMR spectroscopy, Mass spectroscopy, Raman spectroscopy.

Introduction to radioisotopes and their biological applications, Principles and Applications of Geiger Muller (GM) counter, Solid and Liquid scintillation counter, Autoradiography, Radioimmunoassay (RIA) and Radiation Dosimeters.

PRACTICAL LAB-II MB-104: BIOINSTRUMENTATION (Two Credits)

1. Efficacy testing of autoclave employing chemical and biological autoclave indicators.
2. Standardization of pH meter using standard buffers.
3. Studies on pH titration curves of amino acids/acetic acid and determination of pKa values and Handerson-Hasselbach equation.
4. Separation of bacterial lipids/amino acids/sugars/organic acids by TLC and Paper Chromatography.
5. Study of UV absorption spectra of macromolecules (protein, nucleic acid, bacterial pigments).
6. Paper Electrophoresis of proteins.
7. Separation of Proteins/Nucleic acids by gel electrophoresis.
8. Density gradient centrifugation.

REERENCES

1. *Biochemistry*. 6th Edition by Berg, J. M., Tymoczko, J. L. and Stryer, L. (2006). Freeman, New York.
2. *Biophysics: An Introduction* by Cotterill, R. M. J. (2002). John Wiley & Sons, England.
3. *Principles of protein X-ray crystallography* by Drenth, J. (2007). 3rd Ed. Springer, Germany.
4. *Biochemistry*. 3rd edition by Garrett, R. H. and Grisham, C. M. (2004). Brooks/Cole, Publishing Company, California.
5. *Understanding NMR Spectroscopy* by Keeler, J. (2002). John Wiley & Sons, England.
6. *Bioinformatics: sequence and genome analysis* by Mount, D. W. (2001). Cold Spring Harbor Laboratory Press, New York.
7. *Methods in Modern Biophysics*. Second Edition by Nölting, B. (2006). Springer, Germany.
8. *Biophysics* by Patabhi, V. and Gautham, N. (2002). Kluwer Academic Publishers, New York and Narosa Publishing House, Delhi.
9. *Principles and Techniques of Biochemistry and Molecular Biology* by Wilson Keith and Walker John (2005), 6th Ed. Cambridge University Press, New York.
10. *Proteins NMR Spectroscopy: Principles and Practice* by Cavanagh John *et.al.* (1995), Academic Press
11. *Molecular Biophysics: Structures in Motion* by Daune M. and W. J. Duffin (1999), Oxford University Press.
12. *Methods in Modern Biophysics* by Nalting B. and B. Nalting (2003) Springer Verlag
13. *Computational Analysis of Biochemical Systems* by Voit E. O. (2000) Cambridge University Press.
14. *Physical Biochemistry: Applications to Biochemistry and Molecular Biology* by Freilder, D. Freeman, San. Francisco, 1976
15. *Biochemical Techniques: Theory and Practice* by Robyt, John F.; White, Bernard J. Waveland Press, Inc., U.S.A. Published: 1990.