



ADD ON COURSES

BCHEX01: INSTRUMENTAL METHODS OF ANALYSIS FOR BIOLOGISTS, CHEMISTS AND PHYSICISTS

Credit: 2

Total Hours: 36

Objectives: The modern science thinks and works in the lemon light of an interdisciplinary approach. The department of Chemistry at St Berchmans offers an Extra Credit Course entitled Instrumental Methods of Analysis for Biologists, Chemists and Physicists. It introduces a variety of modern analytical techniques which include Mass Spectrometry; UV-Visible, IR, and NMR Spectroscopy; High Performance Liquid Chromatography, Gas Chromatography, Column, Paper and Thin Layer Chromatographic techniques which are useful in all branches of basic science. Besides these, the students can learn the basics of analytical instruments such as pH Meter, Potentiometer, Conductivity Meter, Flame Photometer, Atomic Absorption Spectrometer and Electrochemical Analyzer.

The exposure to modern instrumentation will be advantageous to one seeks career in industry, teaching and research.

Module 1: UV-Visible Spectroscopy

Electromagnetic spectrum, Electronic transitions in molecules, Absorptions, Chromophores, Auxochromes; Instrumentation, UV-Visible Spectral pattern, Finding absorption maxima, Measurement of absorbance and its applications.

Module 2: Infrared Spectroscopy

Vibrations in molecules, Functional Groups and Characteristic Vibrations, Representation of IR spectra; Instrumentation, Applications: Recording and Interpretation of IR spectra.

Module 3: NMR Spectroscopy

Different types of nuclei in nature, classification by spin quantum number; Larmor precession of bosons and fermions; Nuclei in molecules, characterization of molecules by NMR spectroscopy, NMR spectrum, interpretation, and applications in science.

Module 4: Mass Spectrometry

General Principles, Mass Spectral Patterns, Interpretation with examples, Applications.



Module 5: Chromatography

Basic principles of paper, thin layer and column chromatography. Gas Chromatography, HPLC. Applications, Experiments in paper, thin layer and column chromatography at the laboratory.

Module 6: Atomic Absorption Spectrometry

Basic principles and applications. Detection copper, chromium and iron in natural samples using AAS.

Module 7: Electrochemical Analyzer

Basic theory and applications. One or two experiments to familiarize the machine.

Module 8: Elementary Analytical Techniques

Theory and applications of pH meter, Salinometer, Conductivity Meter, Potentiometry, Turbidimetry and Flame Photometer. Experiments.

Reference

1. D. A. Skoog, F. J. Holler, S. R. Crouch, *Principles of Instrumental Analysis*, 6th Edn., Thomson Brooks/Cole, **2007**
2. H. H. Willard, L. L. Merritt, J. A. Dean, *Instrumental Methods of Analysis*, 5th Edn., Van Nostrand, **1974**.
3. G. D. Christian, *Analytical Chemistry*, John Wiley & Sons, 6th Edn, **2004**
4. D. A. Skoog, D. M. West, F. J. Holler, S. R. Crouch, *Fundamentals of Analytical Chemistry*, 8th Edn., Thomson Brooks/Cole, **2007**
5. G H Jeffery, J Bassett, J Mendham, R C Denney, Longman, *Vogel's Text Book of Quantitative Chemical Analysis*, **1989**

Question Paper Pattern for Written Examination (Time: 1½ hrs)

Division	Type	No. of Questions to be Answered	Mark for Each Question	Total Marks
Part A	One word	10 out of 13	1	10
Part B	Short answer	5 out of 8	2	10
Part C	Short Essay	4 out of 6	5	20
Grand Total				40