

Singhania University

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M.PHIL. – CHEMISTRY

Scheme of Examination

S.No.	Paper Code	Name of Paper	Max. Marks	Duration
1.	M.Phil.CH. 01	Research Methodology	100	3 Hrs.
2.	M.Phil.CH. 02	Instrumental analysis	100	3 Hrs.
3.	M.Phil.CH. 03	Material Chemistry	100	3 Hrs.
4.	M.Phil.CH. 04	Dissertation	100	-
Total			400	

Paper I

Research Methodology

Unit I :- Research Methods

Problem selection – Literature survey – Familiarity with ideas and concepts of investigation – acquiring technical skills – drawing inferences from data – qualitative and quantitative analysis – accessing the problems – results and conclusions – presenting a scientific seminar – publication of research paper – art of writing of thesis.

Unit II: - Errors Analysis

Limiting Errors, Types of errors – gross, systematic and random – central value Statistical treatments of data – rejection of data – method of least squares – variance and standard deviation – of combination components – uncertainty analysis and treatment of single sample data – linear regression – Polynomial regression.

Unit III: - Chromatography

Principles – classification of chromatography – TLC, Paper Chromatography- Column chromatography – Ion exchange, Gas chromatography and HPLC.

Unit IV: - Symmetry elements – Symmetry operations – Multiplication table –

Molecular point groups – Matrix representation of symmetry operation – Character table – Symmetry species of point groups – Character table for Point group (C_{2V} and C_{3V}) – distribution of fundamentals among the Symmetry species – Molecular vibrations.

Paper II

Instrumental analysis

Unit I: - Techniques in analytical chemistry

Introduction – Potentiometry – Principle, Reference electrode, Instrumentation and measurement. Spectrophotometry – Principle, Instrumentation, simultaneous Spectrophotometry, Differential, Reflectance spectro photometry, thermal analysis.

Unit II: - Advanced NMR

The Larmor precession – Bloch equation – Pulse FT NMR – Determination of relaxation times – high resolution Hamiltonian – matrix elements of high resonance Hamiltonian .

$^{13}\text{C}_{\text{NMR}}$ Chemical shift and charge density calculation, Broad band decoupling, off resonance Decoupling and Gated Decoupling – Computation of ^{13}C chemical values. Pulse NMR: 1D Pulse experiments, SEFT, SPI, INEPT, DEPT and INADEQHATE. 2D, Principles and applications.

Unit III :- Fourier Transform Spectroscopy

Enhancement of spectra: Computer averaging – fundamental laws of photometry – spectrophotometric accuracy – photometric precision- quantitative methodology- difference spectroscopy- derivative spectroscopy.

Unit IV: - Emission spectra

Flame Emission spectroscopy / Flame photometry: Principles of Flame photometry, Inferences in Flame photometry. Plasma Emission spectroscopy: Introduction, direct current Plasma (DCP) inductively coupled Plasma (ICP), LCP instrumentation.

Paper –III

Materials Chemistry

Unit I: - Polymer & polymerization

Polymer & their classification, polymerization and their classification, Mechanism of polymerization, molecular weight of polymers – number average molecular weight, weight average molecular weight (MW) - structure property relationships in Polymers. Degradation of Polymers, Bio-Polymers.

Unit II:- Composites

Introduction, classification, constituents of composites, fiber reinforced composite, unidirectional fiber reinforced composites, failure of fiber reinforced composite materials, short fiber reinforced composite, particles reinforced composite, particulate reinforced composite, structural composite, advantage of composite, application of composites.

Unit III:- Synthesis and Characterization of Materials

Materials and their classification, Role of Chemistry in Material design. Preparative techniques; Ceramic methods; chemical strategies, chemical vapour deposition; preparation of materials, Langmuir- Blodgett Films. Fabrication of ordered nanostructures. Composition and purity of materials. Preparation and properties of nanofibers.

Unit IV:- Cryogenics

Introduction, cryogenic processing & its mechanism, cryogenic properties of materials, advantages and applications.