

M Phil Chemistry

Duration 1 Year

Course I Semester

Paper	Paper Detail	Marks Theory and Sessional	
MCH 01	Analytical methodologies and methods	100 70&30 (industrial tour & its report writing)	60Hr.
MCH 02	Research Methodologies	100 70 & 30(paper/popular article writing)	60Hr.
MCH 03	Recent advances in chemical Science	100 70 & 30 (Seminar)	60 Hrs
Total Marks		300	

Course II Semester

Dessertation Thesis	100 marks
Presentation	50 marks
Monthly report submission	50 marks
Seminar	100 marks
Grant Total (Semester I + Semester	600 marks

MCH 01: Analytical Methodologies and Methods

b)

Data analysis: Errors, classification of errors, mean deviation and standard deviation, calibration accuracy and precision, measurement of uncertainty, rejection of measurements, confidence interval tests of significance, error curve, minimization of errors, significant figure and computation of results, certified reference material and standard reference material.

Analytical methodologies

(A) *Sampling and sample preparation techniques:*

- ~ Sampling of solids, liquids & gases for organic and inorganic analysis
- ~ Distribution coefficients & distribution ratio
- ~ Extraction techniques for organics & inorganics

(B) *Statistics & data handling*

- ~ Linearity, Accuracy & Precision
- ~ Types of errors in measurements
- ~ Significant figure in measurements & calculations
- ~ Standard deviation
- ~ Statistics, confidence limits, t-test, F-test
- ~ Rejection of results
- ~ Least square plots & coefficient of variation
- ~ Detection limits'
- ~ Statistics of sampling

(C) *Classical techniques of analysis*

- ~ Gravimetric analysis & precipitation

(D) *Modern Instrumental methods of analysis*

- ~ Fundamental, principle, technique, instrumentation and applications of:
 - a) Electro-analytical techniques
 - i) Redox & Potentiometric titration
 - ii) Amperometric techniques

iii) Voltammetric techniques

b) Chromatographic techniques

i) Principle of chromatographic separation

ii) Classification of chromatographic techniques (Hi)

Theory of column efficiency:

- Gas Chromatography (GC)
- Liquid Chromatography:- Planar chromatography, High Pressure Liquid Chromatography, Size exclusion chromatography, Ion chromatography.

c) Spectroscopy

i) Molecular Spectroscopy

ii) Atomic Spectroscopy

d) Thermal analysis

i) Thermal Gravimetric Analysis (TGA)

ii) Differential Thermal Analysis (DTA)

Hi) Differential Scanning Calorimetry (DSC)

MCH 01: Research Methodologies

Section-A

Selection of institute, laboratories, research supervisor, 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.

Preparation and submission of synopsis for registration, preparation of research paper-art of writing of thesis, research agreements. Preparation of research papers, popular articles, book reviews, research projects, and their presentations.

Safety rules of laboratory acquaintance of experimental set up and instruments, intellectual property and intellectual property rights.

Section-B

Data management, importance of safety and security of data, evaluation of inventions. communication with patent council and publication of data, communication with investors, IP sales process .

Techniques of written communication of ideas and experimental outcome in different scientific journals in the form of papers notes review articles, acquaintance with the format of instruction to authors prescribed by different publishers, formalities need to be followed to incorporate the published work of others, abstracting of scientific papers, importance of first author co-author and corresponding author. Copyright and copyright transfer, patent application.

MCH 03: Recent Advancement in Chemical Science

UNIT I

Structural elucidation:

Characterization and CMR: Resolution and multiplicity of ^{13}C NMR, ^1H -decoupling, noise decoupling, broad-band decoupling; Deuterium, fluorine and phosphorus coupling; NOE signal enhancement, off-resonance, proton decoupling, Structural applications of CMR. DEPT; Introduction to 2D-NMR, *PMR:* Natural abundance of ^{13}C , ^{19}F and ^{31}P nuclei.

Green Chemistry:

Nuclear Quadrupolar Resonance (NQR) Spectroscopy: Quadrupolar moment, energy levels of a quadrupolar nucleus and effect of asymmetry parameters and energy levels. Effect of an external magnetic field, selected examples for elucidation of structural aspects of inorganic compounds using NQR spectroscopy.

UNIT-II

Green Chemistry

Introduction, Principles, goals, Green Strategies, Green chemistry in practice, Green Energy: abuses, International standards.

Green computing, origin, Rationale, Regulations and Industry initiatives. Virtualization -

power management, Examples of green chemistry,

Green chemistry as an alternate tool for reducing pollution, green solvents such as water, CO₂, ionic liquids etc, Green synthetic methods, catalytic methods, Organic synthesis in aqueous media, Ionic liquid, super critical fluids, Microwave-induced organic reactions, Real-World cases of Green Chemistry.

Biocatalysts and catalytic reactions, Materials recycling - Bioremediation - overview and applications, Benign Design, GHG emissions, Safer solvents, Pollution Prevention, CFC's and ozone layer, ozone layer depletion.

Industrial operations and green technology chemistry for industrial waste treatment such as distillery, petroleum, fertilizers, paper, steel plants, drug and pharmaceuticals.