BHAGWANT UNIVERSITY

Sikar Road, Ajmer

Rajasthan

Syllabus

Institute of Applied Sciences & Life Sciences

M. Phil I Semester

Chemistry

Course Category

MChe : M.Phil in Chemistry
CCC: Compulsory Core Course
ECC: Elective Core Course

Contact Hours:

L: Lecture
T: Tutorial
P: Practical or Other

Marks Distribution :

IA: Internal Assessment (Test/Classroom Participation/Quiz/Presentation/Assignment etc.)
EoSE: End of Semester Examination

M. Phil (Chemistry)

(Course Structure)

Subject code	Subject Name	Teaching hours			Marks		
		L	T	P	External	Internal	Total
01MChe101	**Research Methodology**	3	0	0	70	30	100
01MChe102	**ADVANCED CONCEPTS IN INORGANIC CHEMISTRY**	**3**	**0**	**0**	**70**	**30**	**100**
01MChe103	**ADVANCED ORGANIC CHEMISTRY**	3	0	0	70	30	100

01MChe104	**ADVANCED ANALYTICAL CHEMISTRY**	**3**	**0**	**0**	**100**		**100**
Total		**12**	**0**	**0**	**280**	**120**	**400**

SEMESTER II

Subject code	**Subject Name**	**Teaching hours**			**Marks**		
		L	**T**	**P**	**External**	**Internal**	**Total**
02MChe101	**Advanced Research Methodology**	3	0	0	70	30	100
02MChe102	**Physical chemistry and Spectroscopy**	**3**	**0**	**0**	**70**	**30**	**100**
02MChe103	**Concepts of Analytical & Biological Chemistry**	3	0	0	70	30	100
02MChe104	**Dissertation**	**3**	**0**	**0**	**50**	**50**	**100**
Total		**12**	**0**	**0**	**260**	**140**	**400**

Paper I

RESEARCH METHODOLOGY

Paper Code: 01MChe101
Marks -100
External- 70 Marks
Internal - 3**0 marks**

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

Sources of data collection: Primary and Secondary.
Methods and techniques : Survey, case study, Probability and Sampling.

Mean, Standard Deviation, Coefficient of Variation.

Correlation, chi-quare test. Analysis, Q test, Interpretation and Report writing.

Unit-IV

Nanotechnology: Introduction, types of nanotechnology, Top down and bottom up techniques, Synthesis of nanomaterials; Plasma arc, Chemical Vapor Deposition, Sol-gel Techniques,

Unit-V

Advanced Characterisation tools for nanomaterials ; scanning electron microscopy (SEM) and Transmission Electron Microscopy (TEM).

PAPER II- ADVANCED CONCEPTS IN INORGANIC CHEMISTRY

Paper Code: 01MChe102

Unit-I

COMPLEXES- REACTION MECHANISM

Electron Transfer Mechanism

Outer sphere reaction

Inner sphere reaction

Mechanism criteria

Two electron transfer and other redox reactions

Unit-II

Stereo-chemical Non rigid coordination compounds

Isomerisation and racemisation of tris chelate compounds. Metal carbonyl compounds

UNIT :III

CERAMIC COMPOUNDS (CUPRATE OXIDE)

Introduction

Family of cuprate oxide compounds

214 La-Pa-Cu-O

123 Y-Ba-Cu-O

2021 A2Co - X Bx Cu Om 1-4

1021 A=B1n-1 or T1= Sr or Ba

Structure

Bond structure

Chemistry of ceramic compounds

Doping effect

Application – Super Conductivity

SOLID STATE CHEMISTRY

Structure imperfection and properties of solids such as ionic conductivity, diffusion Ferroelectric properties and luminescence optical and thermal excitation in solids phosphorescence and laser properties of inorganic compounds. Methods of analyzing solid state dislocations, their

mechanism and reactions.

UNIT :IV

POLYMERS

High Polymers and Macromolecules:

Nature of Macromolecules, Forces involved in high polymers interaction, methods for studying size and shapes of high polymers by various experimental techniques, sedimentation, ultracentrifuge, Viscosity, Electrophoric and diffraction methods, configuration of polymer molecules ,Rubber, elasticity and crystallanity of polymer structure. Transition Helix

UNIT :V

PHYSICO CHEMICAL ASPECT OF AIR AND WATER POLLUTION

Air Pollution : General consideration, Air pollution, type of pollution and unit of measurement, Air quality standards, Sampling and monitoring, Source and effects of air pollution caused by carbon monoxide, oxide of nitrogen, sulphur dioxide, ozone, water vapours. Aerosols and minor pollutant gases, Indoor pollution, Composition of atmosphere- Troposphere Stratosphere Mesosphere and Thermosphere **Water Pollution: Pollution** cycle in environment, aquatic

environmentwater pollutants, Trace element in water, specification with special reference to copper, lead mercury and arsenic, water quality parameters and standards, sample presentation.Role of bulk and trace metals in biological systems, microelements, active transport of Na, Mg and Ca across the biological membrane. Iron storage and transport, copper proteins, metalloenzymes, general discussion of enzymes functions of metal ions, inhibition (Explorationbased on coordination chemistry) vitamins B12 and B12 coenzymes.

Paper IV

ADVANCED ANALYTICAL CHEMISTRY

Paper Code:
01MCHE104

Unit I : Gas Chromatography

Principles – classification of chromatography – TLC, Column chromatography – Ion exchange, Gas chromatography.

Unit II: **HPLC**

Principles of high performance liquid chromatography.The liquid Chromatography

The requirements of solvent coming and different pumping system, gradient elution Isoerotic elution sampling.Detectors for liquid chromatography.The mobile Phase in H.P.L.C (i) Polarity (ii) Solvent degassing Column technologyColumn selection in H.P.L.C

Unit III :

Electron diffraction scattering of electron by atoms, procedure of obtaining electron diffraction, Analysis of results and application

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.

Unit V : NMR Spectroscopy

Interpretation of 13 C spectra (peak assignments)

Chemical shifts

Spin – Spin coupling

Peek assignment problems

Second order effect. NO

SEMESTER II

Paper Code: 02MChe101
Marks -100
External- 70 Marks
Internal - 3**0 marks**

ADVANCED RESEARCH METHODOLOGY

UNIT I

CONFIDENCE LIMITS , STATISTICAL AIDS TO HYPOTHESIS TESTING TYPE I AND TYPE 11 ERRORS ,DETECTION OF GROSS ERRORS , ESTIMATION OF DETECTION LIMITS .

UNIT II

THE LEAST SEQRE METHOD FOR DRAWING CALIBRATION PLOT ,QULITY ASSUREANCE AND CONTROL CHART ,SIGNIFICANT FIGURST SATISTICAL TREATMENT OF DATA ,REJECTION OF DATA , VARIANCE AND STANDARD DATA ANAYLYSIS , STATISTICAL USE IN CHEMISTRY RESEACH

UNIT III

REPORT WRITING: TYPES OF MASNUSCRIPT , REVIEW , ORIGINAL MANUSCRIPT , SHORT COmmunication , presenting a scientific seminar publication of research paper.

UNIT IV

Basic principal and technique to be adpoted for writing a m.phll dissertation and ph.d thesis ISSN NO. ISBN NO.cition index , impact factor of journals

UNIT V

Research Ethics AND Plagiarism ,type of reference style

PAPER II- Physical Chemistry and Spectroscopy

Paper Code: 02MChe102

Unit-I

Free radical reaction : introduction , kinetics characteristic of free radical reaction . derivation of steady state law , absolute rate absolute reaction rate , kinetics and solvent effects . Induced reaction : defination , types of induced reaction ,examples of induced reaction , induced reaction employing oxidants such as Cr (vI)and Mn(VII), mechanism of induced reactions.

Unit-II

Fast reaction: Introduce, difference between slow and fast reaction such as flow methods and relaxation methods and NMR techniques, flash photolysis.

1. Jablonski diagram in photochemical reaction, relative times events.
2. Reaction of single Molecular oxygen: Introduction ,discovery, formation method for detection, estimation and quenching, reaction of singlet molecular oxygen with organic compounds.
   Voltammetry & cyclic voltammetry, Anodic stripping voltammetry.

Unit-III

Spectroscopy

Electron diffraction: scattering of electrons by atoms, procedure of obtaining electron diffraction, analysis of results and application.

Neutron diffraction: Scattering of slow neutrons by atoms, procedures for obtaining neutron diffraction, analysis of result and applications.

Mossabauer Spectroscopy: Introductions, application to Be and Sn Systems.

Photo acoustic spectroscopy : basic principal of photo acoustic spectroscopy (PAS),PAS gases $ surface .

Unit-IV

Molecular luminescence spectroscopy:

Introduction to molecular luminescence (fluorescence , phosphoresencence and chemiluminescence);theory of luminesnces ;instrument for measuring fluoremeter (flourmeter and spectrofluorometer); application and problem .

Electron Spectroscopy :

Introduction to electron spectroscopy (ESCA Auger and UPS) Principal and theory of ESCA , instrumentation , chemical shift , satellite pecks and spectral spitting ;application and problem

Unit-V

Advanced spectroscopy :

13 C- NMR spectroscopy ; difficulties and solution for recording 13 C-NMR spectra recording of 13C-NMR spectra – scale , solvents , solvent signal and their position multiplicity , 13 C-1H coupling contact – proton coupled and decoupled 13C spectra , bond bond decoupling off resonance technique . chemical shifts in C spectra chemical shifts calculation for alkanes, alkenes and alkynes, chemical shifts calculation in internal and terminal substituted compounds. Use of 13C spectra in differentiating stereoisomers, Nuclear Overhauser effect13 DEPT spectra – differentiation in primary , secondary and tertiary carbons by dept -45 , DEPT – 90 ,DEPT -135 spectra 2D NMR spectroscopy ;Theory and principles of 2d

NMR spectrscopy interpretation of 1H-H COSY, 1H-13 C HETORY ,HMQC , HMBC , INADEQUATE spectra.

Mass spectroscopy : theory and principle of mass spectroscopy, instrumentation , low and high resolution mass spectra , ionization , techniques – electron impact ionization , chemical Ionization ,field desorp tion ,fast Ion bombardement Electronspary Ionization and matrix assisted laser desorption / Ionization. Determination of molecular weight and moiecular formula. Nitrogen rule , detection of molecularion peak ,metastable ion peak. Fragmentation – rules governing the fragmentation ,mcLafferty rearrangement . interpretation of mass spectra of different class of compounds – saturated and unsaturated of mass spectra of different class of compounds – saturated and unsaturated hydrocarbons, aromatic hydrocarbons, alcohols, ethers, ketones, aldehydes, carboxylic acids, amines, amides, compounds containing halogens.

Paper Code: 02MChe103
Marks -100
External- 70 Marks
Internal - 30 marks

Concepts Of Analytical And Biological Chemistry

UNIT I

Physico chemical Aspects of Air and water pollution Air Pollution : Air quality standards, sampling and monitoring of air pollutants-gaseous and particulate, source and effects of air pollution caused by carbon monoxide, oxide of nitrogen, sulphur dioxide , ozons, water vapours, aerosols and minor pollutant gases, indoor pollution, composition of atmosphere- Troposphere stratosphere, mesosphere and Thermosphere.

UNIT II

Water pollution: water quality parameters and standards, classification and sampling of water pollution –solid waste, industrial, agricultural,oil, radioactive

wate, thermal pollution . instrumental techniques for analyzing metal pollutants in water.

UNIT III

Co-enzymes & Metal ions in Biological system Role of bulk and trace elements in biological system, micro-elements, active transport of Na,Mg and Ca across the biological membrane.Iron storage and transport , copper proteins , metalloenzymes , general discussions of enzymes functions of metal ions , inhibition (Exploration bassed on coordination chemistry)

UNIT IV

Vitamins B12 and B12 coenzymes

Hypnotics and sedatives – barbiturate & phenobarbitone sodium CNS Stimulant – caffeine , ethamivan

UNIT V

Chromatographic techniques

Theory, instrumentation and application of:

(1) Gas Chromatography
(2) High Performance liquid Chromatography

Paper Code: 02MChe104
Marks -100
External- 50 Marks
Internal - 50 marks

DISSERTATION