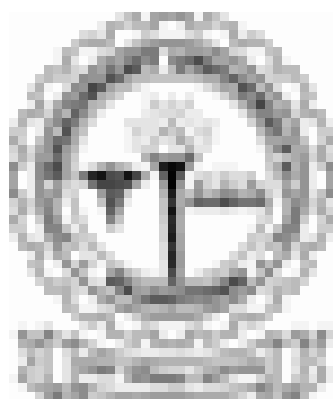


BHAGWANT UNIVERSITY

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

01MChem104	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
02MChem101	Advanced Research Methodology	3	0	0	70	30	100
02MChem102	Physical chemistry and Spectroscopy	3	0	0	70	30	100
02MChem103	Concepts of Analytical & Biological Chemistry	3	0	0	70	30	100
02MChem104	Dissertation	3	0	0	50	50	100
Total		12	0	0	260	140	400

Paper I

RESEARCH METHODOLOGY

Paper Code: 01MCh101

Marks -100

External- 70 Marks

Internal - 30 marks

Unit - 01

Research - definition - importance and meaning of research - characteristics of research - types of research - steps in research - identification, selection and formulation of research problem – research questions - research design - formulation of hypothesis - review of literature

Unit - 02

Sampling techniques: sampling theory - types of sampling - steps in sampling - sampling and non-sampling error - sample size - advantages and limitations of sampling. Collection of data : primary data - meaning - data collection methods - secondary data - meaning - relevances, limitations and cautions.

Unit - 03

Statistics in research - measure of central tendency - dispersion - skewness and kurtosis in research. Hypothesis - fundamentals of hypothesis testing - standard error - point and interval estimates - important non-parametric tests : sign, run, kruskal - wallis tests and mann-whitney test.

Unit - 04

Para metric tests: testing of significance - mean, proportion, variance and correlation - testing for significance of difference between means, proportions, variances and correlation co-efficient. Chi-square tests - anova - one-way and two-way.

Unit - 05

Research report: types of reports - contents - styles of reporting - steps in drafting reports - editing the final draft - evaluating the final draft.

PAPER II- ADVANCED CONCEPTS IN INORGANIC CHEMISTRY

Paper Code: 01MCh102

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 B_x 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, Electrophoretic and diffraction methods,
configuration of polymer molecules ,Rubber, elasticity and crystallinity 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 environment water 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 (Exploration based 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 technology Column 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 ¹³C spectra (peak assignments)

Chemical shifts

Spin – Spin coupling

Peak assignment problems

Second order effect. NO

SEMESTER II

Paper Code: 02MCh101

Marks -100

External- 70 Marks

Internal - 30 marks

ADVANCED RESEARCH METHODOLOGY

UNIT I

Basic concepts: Research process, problem identification, research designs, informal experimental designs. Completing randomised design, randomized block design, latin square design, factorial designs

UNIT II

Sampling and testing of hypothesis: Concept of probability, probability distribution, Normal, Poisson, χ -square, t-test. Sampling distribution, central limit theorem, Sandler's A-test, standard error, population mean, population proportion, sample size, confidence intervals, null hypothesis and alternative hypothesis, level of significance, two tailed and one tailed tests, Z-test, t-test, χ^2 -test, F-test, testing of correlation coefficients, ANOVA one way ANOVA, two way ANOVA Tukey's HSD.

UNIT III

Non-parametric tests: Sign test, Fisher-Irwin test, Mc Nemer test, Wilcoxon Mann test, Wilcoxon, Mann-Whitney test, Kruskal-Wallis test, one sample runs test. Spearman's rank correlation, Kendall's coefficient of concordance.

UNIT IV

Multivariate analysis: Multiple regression, multiple discriminant analysis, multiple analysis of variance, canonical correlation analysis, Factor analysis cluster analysis, path analysis. Computational techniques.

UNIT V

Computer Application, Basic of computer, System Software & application Software. Computer as a tool of Research: Application in Data Analysis, related software. MS Office, SPSS, Data Communication, LAN & WAN Data Exploration using internet tools, e-journal, e-books, basic concept of tele-conferencing & related configuration.

References:

1. Kothari, C.R.(2004). Research Methodology: Methods and Techniques, New Age International Publishers, New Delhi.
2. Arya., P.P. and Pal, Y.(2001) Research Methodology in Management: Theory and Case Studies. Deep and Deep Publishers Pvt. Ltd., New Delhi.

PAPER II- Physical Chemistry and Spectroscopy

Paper Code: 02MCh102

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

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.

Mossbauer 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 , phosphorescence and chemiluminescence);theory of luminescences ;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 peaks and spectral spitting ;application and problem

Unit-V

Advanced spectroscopy :

¹³C- NMR spectroscopy ; difficulties and solution for recording ¹³C-NMR spectra recording of ¹³C-NMR spectra – scale , solvents , solvent signal and their position multiplicity , ¹³C-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 desorption ,fast Ion bombardement Electrospray Ionization and matrix assisted laser desorption / Ionization. Determination of molecular weight and molecular formula. Nitrogen rule , detection of molecular ion 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 based 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