

# **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)**

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

<b>01MCh104</b>	<b>ADVANCED ANALYTICAL CHEMISTRY</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>100</b>		<b>100</b>
<b>Total</b>		<b>12</b>	<b>0</b>	<b>0</b>	<b>280</b>	<b>120</b>	<b>400</b>

## **Paper I**

### **RESEARCH METHODOLOGY**

**Paper Code: 01MCh101**

**Marks -100**

**External- 70 Marks**

**Internal - 30 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-square 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: 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  $A_2Co - X B_x Cu O_m$  1-4

1021  $A=B_{1n-1}$  or  $T_1 = Sr$  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 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 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 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  $^{13}\text{C}$  spectra (peak assignments)

Chemical shifts

Spin – Spin coupling

Peak assignment problems

Second order effect. NO