

DEPARTMENT OF CHEMISTRY

COURSE CURRICULUM & MARKING SCHEME

M.Sc. CHEMISTRY

Semester - IV

SESSION : 2024-25



ESTD: 1958

GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG, 491001 (C.G.)

(Former Name – Govt. Arts & Science College, Durg)

NAAC Accredited Grade A⁺, College with CPE - Phase III (UGC), STAR COLLEGE (DBT)

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Department of Chemistry
Govt. V.Y.T. PG Autonomous College
Durg (C.G.)



M.Sc. Chemistry

Fourth Semester

2024-25

Syllabus and Marking Scheme for Fourth Semester

Session 2024-25

Paper No.	Title of the Paper	Marks Allotted in Theory		Marks Allotted in Internal Assessment		Credits
		Max	Min	Max.	Min.	
I	SOLID STATE AND PHOTOCHEMISTRY	80	16	20	04	05
II	BIO-PHYSICAL CHEMISTRY	80	16	20	04	05
III	ANALYTICAL CHEMISTRY	80	16	20	04	05
IV	Elective- A : ORGANOTRANSITION METAL CHEMISTRY Elective-B : MEDICINAL CHEMISTRY Elective- C : CHEMICAL KINETICS Elective-D: NANOMATERIALS AND NANOTECHNOLOGY	80	16	20	04	05
V	Lab Course I PROJECT	100	36	----	----	04
IV	Lab Course II PRACTICAL (A, B OR C)	100	36	----	----	04
	Total	520	----	80	----	28

04 Theory papers	-	320
04 Internal Assessments	-	80
01 Practical + 01 Project	-	200
Total Marks	-	600

Note: 20 marks = 01 credit in Theory Papers and 25 Marks = 01 Credit in Practical/Project work

The syllabus for M.Sc. Chemistry is hereby approved for the sessions 2023-24 and 2024-25

Name and Signatures	Departmental members Name and Signatures
Chairperson /H.O.D <u>Asthana</u>	1. <u>[Signature]</u>
Subject Expert (University Nominee)	2.
Subject Expert..... <u>H.M. Dhabej</u>	3. <u>[Signature]</u>
Subject Expert..... <u>SJ</u>	4. <u>[Signature]</u>
Subject Expert.....	5. <u>[Signature]</u> <u>[Signature]</u>
Representative (Industry)	6. <u>[Signature]</u>
Representative <u>[Signature]</u> (Alumni)	7. <u>[Signature]</u>
Representative <u>[Signature]</u> (Professor Science Faculty Other Dept.)	8. <u>[Signature]</u>
	9. <u>[Signature]</u>
	10. <u>[Signature]</u>
	11. <u>[Signature]</u>
	12. <u>[Signature]</u>

M.Sc. CHEMISTRY
SEMESTER IV
2024-25
PAPER- I
SOLID STATE AND PHOTOCHEMISTRY

Max. Marks 80
Min. Marks 16

Unit-I **Crystal Defects and Non-Stoichiometry**

Perfect and imperfect crystals, intrinsic and extrinsic defects-point defects, line and plane defects, vacancies - Schottky defects and Frenkel defects. Thermodynamics of Schottky and Frenkel defect formation, colour centres, non-stoichiometry defects.

Organic Solids

Electrically conducting solids, organic charge transfer complex, organic metals, new superconductors.

Unit - II **Electronic Properties and Band theory**

Metals, insulators and semiconductors, electronic structure of solids – band theory, band structure of metals, insulators and semiconductors. Intrinsic and extrinsic semiconductors, doping semiconductors, p-n junctions, super conductors.

Optical properties- Optical reflectance, photoconduction - photoelectric effects.

Magnetic properties-Classification of materials: Quantum theory of paramagnetism-cooperative phenomena - magnetic domains, hysteresis.

Unit - III **Photochemical reactions and Reaction Mechanism**

Interaction of electromagnetic radiation with matter, types of excitations, fate of excited molecules, quantum yield, transfer of excitation energy, actinometry. Classification, rate constants and life times of reactive energy states - determination of rate constants of reactions. Effect of light intensity on the rate of photochemical reactions. Types of photochemical reactions - photo-dissociation, gas phase photolysis.

Photochemistry of Carbonyl and Aromatic Compounds

Intramolecular reactions of carbonyl compounds - saturated, cyclic and acyclic, β , γ - unsaturated and α , β - unsaturated compounds. Cyclohexadienones. Intermolecular cycloaddition reactions - dimerisations and oxetane formation. Isomerizations, additions and substitutions of aromatic compounds.

Unit - IV **Photochemistry of Alkenes**

Intramolecular reactions of the olefinic bond - geometrical isomerism, cyclisation reactions, rearrangement of 1, 4 and 1,5 dienes.

Miscellaneous Photochemical Reactions

Photo-Fries reactions of anilides. Photo-Fries rearrangement. Barton reaction. Singlet molecular oxygen reactions. Photochemical formation of smog. Photodegradation of polymers. Photochemistry of vision.

LIST OF REFERENCE BOOKS:

1. Principles of the Solid State, H.V. Keer, Wiley Eastern.
2. Solid State Chemistry, N.B. Hannay
3. Solid State Chemistry, A.K. Chakrobarty, New Age International.
4. Solid State Chemistry and its Application, A.R. West, Plenum.
5. Fundamentals of Photochemistry, K.K. Rohtagi - Mukherji, Wiley- Eastern.
6. Molecular Photochemistry, N.J. Turro, W.A. Benjamin.
7. Organic Photochemistry, J. Coxon and B. Halton, Cambridge University Press.
8. Photochemistry, R.P. Kundall and A Gilbert, Thomson Nelson.

Question Paper Format and Distribution of Marks for PG Semester Examination

Question paper format for the Post-Graduate Examination has been revised from the Session 2022-23. The revised format will be applicable for all the question papers of Semester I, II, III & IV. The following are the main points of the new format:

1. The question paper will be of **80 marks**
2. Questions will be asked Unit-wise in each question paper.
3. From each Unit, the questions will be asked as follows :

- Q.1 Very short answer type question
(Answer in one or two sentences) (02 Marks)
- Q.2 Very short answer type question
(Answer in one or two sentences) (02 Marks)
- Q.3 Short answer type question (Answer in 200-250 words) (04 Marks)
- Q.4 Long answer type questions (Answer in 400-450 words) (12 Marks)

Type of Question	Unit-I	Unit-II	Unit-III	Unit-IV
Very Short (2 Questions) (Maximum two sentences)	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks
Short (1 Question) 200-250 words	1 x 4 = 4 Marks	1 x 4 = 4 Marks	1 x 4 = 4 Marks	1 x 4 = 4 Marks
Long answer (1 Question) 400-450 words	1 x 12 = 12 Marks	1 x 12 = 12 Marks	1 x 12 = 12 Marks	1 x 12 = 12 Marks

Note:

1. Question no. 1 and Question 2 will be compulsory.
2. Question no. 3 and 4 will consist of 2 optional questions of which one has to be attempted.
3. As mentioned above, two compulsory very short answer type questions (2+2 marks), one short answer type question with internal choice (4 marks) and one long answer type question with internal choice (12 marks) will be asked from each unit.

Thus there will be questions of 20 marks from each unit and of total 80 marks from all the four units of the syllabus/syllabi.

M.Sc. CHEMISTRY

Semester IV

2024-25

Paper - II

BIOPHYSICAL CHEMISTRY

Max. Marks 80

Min. Marks 16

Unit - I **Cell Membrane and Transport of Ions**

Structure and functions of cell membrane, ion transport through cell membrane. Nerve conduction.

Metals in Biological System

Essential and trace metals. Na^+ , K^+ pump - Role of metal ions in biological processes. Transport and storage of dioxygen- Heme proteins and oxygen uptake, structure and function of hemoglobin, myoglobin, hemocyanin and hemerythrin, model synthetic complexes of iron, cobalt and copper.

Unit - II **Electron Transfer in Biology**

Structure and function of metalloproteins in electron transport processes- cytochromes and iron-sulphur proteins, synthetic models. Nitrogenase - Biological nitrogen fixation, molybdenum nitrogenase, spectroscopic and other evidence, other nitrogenases model systems.

Unit - III **Bioenergetics and ATP Cycle**

DNA polymerization, glucose-storage, metal complexes in transmission of energy, chlorophylls, photosystem I and photosystem II in cleavage of water. Model systems. Standard free energy change in biochemical reactions, exergonic, endergonic. Hydrolysis of ATP, synthesis of ATP from ADP.

Unit - IV **Statistical Mechanics in Biopolymers**

Chain configuration of macromolecules, statistical distribution end to end dimensions, calculation of average dimensions for various chain structures. Introduction to protein folding problem.

Biopolymer Interaction

Forces involved in biopolymer interaction. Electrostatic charges and molecular expansion, hydrophobic forces, dispersion force interactions. Various types of binding processes in biological systems. Hydrogen ion titration curves.

Thermodynamics of Biopolymer Solutions

Thermodynamics of biopolymer solutions, osmotic pressure, membrane equilibrium, muscular contractions and energy generation in mechanochemical system.

LIST OF REFERENCE BOOKS

1. Principle of Bioinorganic Chemistry, S.J. Lippard and J.M. Berg, University Science Books.
2. Bioinorganic Chemistry, I. Bertini, H.B. Gray, S.J. Lippard and J.S. Valentine, University Science Books.
3. Inorganic Biochemistry, Vol. I and II, G.L. Eichhorn Elsevier.
4. Progress in Inorganic Chemistry, Vol. 18 and 38, ed J.J. Lippard. Wiley.
5. M.N. Huhey, Wiley Eastern.
6. Principles of Biochemistry, A.L. Lehninger, Worth Publishers.
7. Macromolecules: Structure and Function, F. Wold, Prentice Hall.
8. Biophysical Chemistry, Gurtu and Gurtu, PragatiPrakashan.

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M.Sc. CHEMISTRY
SEMESTER IV
2024-25
PAPER- III
ANALYTICAL CHEMISTRY

Max. Marks 80
Min. Marks 16

Unit - I **Introduction of Analytical Chemistry**

Role of analytical chemistry. Classification of analytical methods- classical and instrumental. Basic idea of instrumental analysis. Selecting an analytical method. Volumetric glassware- cleaning and calibration of glassware. Sample preparations - dissolution and decompositions. Gravimetric techniques. Safety in the laboratory.

Errors and Evaluation

Definition of terms in mean and median. Precision- standard deviation, relative standard deviation. Accuracy - absolute error, relative error. Types of error in experimental data- determinate (systematic), indeterminate (or random) and gross. Sources of errors and the effects upon the analytical results. Methods for reporting analytical data. Statistical evaluation of data.

Unit - II **Analysis of body fluids**

Serum electrolytes, blood glucose, blood urea nitrogen, uric acid, albumin, globulins, barbiturates, acid and alkaline phosphatases. Immunoassay: principles of radio immunoassay (RIA) and applications. Blood gas analysis- trace elements in the body.

Drug analysis

Narcotics and dangerous drugs. Classification of drugs. Screening by gas and thin layer chromatography and spectroscopic measurements.

Unit - III **Food Analysis**

Moisture, ash, crude protein, fat, crude fibre, carbohydrates, calcium, potassium, sodium and phosphate. Food adulteration- common adulterants in food, contamination of food stuffs. Microscopic examination of foods for adulterants. Pesticide analysis in food products - general extraction and purification of samples. HPLC and Gas chromatography for organophosphates, Thin layer chromatography for identification of pesticides in food products.

Unit - IV **Fuel Analysis**

Types of fuels, Solid fuels- Ultimate and proximate analysis - heating values, grading of coal. Liquid fuels - flash point, aniline point, octane number and carbon residue. Gaseous fuels - producer gas and water gas, calorific value.

Radioactive techniques

Tracer technique, neutron activation analysis, counting technique - GM counter, ionisation and proportional counter.

LIST OF REFERENCE BOOKS

1. Basic Concepts of Analytical Chemistry, S.M.Khopkar, Wiley Eastern.
2. Environmental Solution Analysis, S.M.Khopkar, Wiley Eastern
3. Standard method of Chemical Analysis, F.J. Welcher vol.41 Van nostrand Reinhold Co.
4. Elemental Analysis of Airborne practices Ed. S. Lands George & M.C. Reichmann, Gordon & Breach Sci. Pub.
5. Environmental Chem., C. Baird, W.H. Freeman.
6. Analytical Chem., G.D. Christian, J. Willey.
7. Fundamentals of Anal. Chem., A. Skoog, D. M. West & F. J.Holler

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M.Sc. CHEMISTRY

SEMESTER IV

2024-25

PAPER- IV Elective – A

ORGANOTRANSITION METAL CHEMISTRY

Max. Marks 80

Min. Marks 16

Unit-I

Alkyls and Aryls of Transition Metals

Types, routes of synthesis, stability and decomposition pathways, organocopper in organic synthesis.

Fluxional Organometallic Compounds

Fluxionality and dynamic equilibria in compounds such as η^2 - olefin, η^3 - allyl and dienyl complexes.

Unit II

Compounds of Transition Metal-Carbon Multiple Bonds

Alkylidenes, alkylidyne, low valent carbenes and carbynes - synthesis, nature of bond structural characteristics, nucleophilic and electrophilic reaction on the ligands, role in organic synthesis.

Unit - III

Transition Metal π - Complexes

Transition metal π - complexes with unsaturated organic molecules, alkenes, alkynes, allyl, diene, dienyl, arene and trienyl complexes, preparations, properties, nature of bonding and structural features. Important reactions relating to nucleophilic and electrophilic attack on ligands and to organic synthesis.

Unit - IV

Homogeneous Catalysis

Stoichiometric reactions for catalysis, homogeneous catalytic hydrogenation, Zeiglar-Natta polymerization of olefins, catalytic reactions involving carbon monoxide such as hydrocarbonylation of olefins (oxo reaction), oxopalladation reactions, activation of C-H bond.

Transition Metal Compounds with Bonds to Hydrogen

Transition metal compounds with bonds to hydrogen.

LIST OF REFERENCE BOOKS:

1. Principles and Application of Organotransition metal Chemistry, J.P. Collman, L.S. Hegsdus, J.R. Norton, and R.G. Finke, University Science Books.
2. The Organometallic chemistry of the transition metals, R.H. Crabtree, John Wiley.
3. Metallo - organic chemistry, A.J. Pearson, Wiley.
4. Organometallic chemistry, R.C. Mehrotra and A. Singh, New age International

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- Q.4 Long answer type questions (Answer in 400-450 words) **(12 Marks)**

Type of Question	Unit-I	Unit-II	Unit-III	Unit-IV
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Short (1 Question) 200-250 words	1 x 4 = 4 Marks	1 x 4 = 4 Marks	1 x 4 = 4 Marks	1 x 4 = 4 Marks
Long answer (1 Question) 400-450 words	1 x 12 = 12 Marks	1 x 12 = 12 Marks	1 x 12 = 12 Marks	1 x 12 = 12 Marks

Note:

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M.Sc. CHEMISTRY

SEMESTER IV

2024-25

PAPER- IV Elective – B MEDICINAL CHEMISTRY

Max. Marks 80

Min. Marks 16

Unit - I

Introduction to Drugs and Drug Design

Essential and orphan drugs, nomenclature of drugs-IUPAC, routes of drug administration, adverse effects of drugs- type, side effects and minimization. Development of new drugs and factors affecting it, procedures followed in drug design. Theories of drug activity: occupancy theory, rate theory, induced fit theory and macro-molecular perturbation theory. Quantitative structure activity relationship (QSAR). History and development of QSAR. Concepts of drug receptors. Elementary treatment of drug receptor interactions.

Pharmacokinetics

Introduction to drug absorption, disposition, elimination using pharmacokinetics, important pharmacokinetics parameters in defining drug disposition and in therapeutics. Mention of uses of pharmacokinetics in drug development process.

Unit - II

Pharmacodynamics

Introduction, elementary treatment of enzyme stimulation, enzyme inhibition, sulphonamides, membrane active drugs, drug metabolism, xenobiotics, biotransformation, significance of drug metabolism in Medicinal Chemistry.

Psychoactive Drugs - The Chemotherapy of Mind

Introduction, neurotransmitters, CNS depressants, general anaesthetics, mode of action of hypnotics, sedatives, anti-anxiety drugs, benzodiazepines, buspirone, neurochemistry of mental diseases. Antipsychotic drugs-the neuroleptics, antidepressants, butyrophenones, serendipity and drug development, stereochemical aspects of psychotropic drugs. Synthesis of diazepam, oxazepam, chlorazepam, alprazolam, phenytoin, ethosuximide, trimethadione, barbiturates, thiopental sodium, glutethimide.

Unit - III

Local Anti-infective Drugs

Introduction and general mode of action. Synthesis of sulphonamides, furazolidone, nalidixic acid, ciprofloxacin, norfloxacin, dapsone, p-amino salicylic acid, isoniazid, ethionamide, ethambutal, fluconazole, econazole, griseofulvin, chloroquin and primaquin.

Cardiovascular Drugs

Introduction, cardiovascular diseases, drug inhibitors of peripheral sympathetic function, central intervention of cardiovascular output, Direct acting arteriolar dilators. Synthesis of amyl nitrate, sorbitrate, diltiazem, quinidine, verapamil, methyl dopa, atenolol, oxyproprenolol.

Antimalarials

Synthesis and properties of the following Antimalarial .Quinine, 8 - amino quinoline derivatives - Pamaquine, Primaquine, Pentaquine, Isopentaquine, 4-amino quinoline derivatives- Santoquine, camaquine, Acridine derivatives, - Mepacrine, AzacrinPaludrine, Pyremethamine.

Unit - IV

Antibiotics

Cell wall biosynthesis, biosynthesis of cell wall polysaccharides, inhibitors, β - lactam rings, antibiotics inhibiting protein synthesis. Synthesis of penicillin G, penicillin V, ampicillin, amoxycillin, chloramphenicol, cephalosporin, tetracyclinand streptomycin.

Antineoplastic Agents

Introduction, cancer chemotherapy, special problems, role of alkylating agents and antimetabolites in treatment of cancer. Mention of carcinolytic antibiotics and mitotic inhibitors. Synthesis of mechlorehamine, cyclophosphamide, melphalan, uracil, mustards and 6-mercaptapurine.Recent development in cancer chemotherapy. Hormone and natural products.

LIST OF REFERENCE BOOKS:

1. Insecticides of Natural Origin, Sukh Derv, Harwood, Academic Publishers.
2. Introduction to Medicinal Chemistry, AGringuage, Wiley - VCH.
3. Wilson and Gisvold's Text Book of Organic Medicinal and Pharmaceutical Chemistry, Ed Robert F. Dorge.
4. An Introduction to Durg Design, S.S. Pandeya and J.R. Dimmock, New Age International.
5. Burger's Medicinal Chemistry and Drug Discovery, Vol.-1 (Chapter-9 and Ch -14) Ed. M.E. Wolff,John Wiley.
6. Goodman and Gilman's Pharmacological Basis of Therapeutics, McGraw- Hill.
7. The Organic Chemistry of Drug Design and Drug Action, R.B. Silverman, Academic Press.
8. Strategies for Organic Drug Synthesis and Design, D. Lednicer, John Wiley.

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Type of Question	Unit-I	Unit-II	Unit-III	Unit-IV
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M.Sc. CHEMISTRY

Semester IV

2024-25

Paper– IV Elective - C

CHEMICAL KINETICS AND NUCLEAR CHEMISTRY

Max. Marks 80

Min. Marks 16

Unit - I

Kinetics of Composite Reactions

Types of composite mechanism, rate equation for composite mechanisms- simultaneous and consecutive reactions, microscopic reversibility, some inorganic mechanisms- formation and decomposition of phosgene, decomposition of nitrogen pentoxide and ozone and thermal para-ortho hydrogen conversion.

Kinetics of Catalytic Reactions

Kinetics of acid-base catalysis: general and specific, hydrolysis of ester and amide; Enzyme catalysis, Micellar catalysis.

Activation Parameters

Activation parameters from experimental results- Arrhenius factor, standard free energy of activation, standard enthalpy of activation, entropy of activation and their physical significance.

Unit - II

Acidity function and various rate correlations

Hammett acidity function, various treatments of rate correlation, Linear Free Energy Relationship (LFER), The Hammett equation, Zucker-Hammett hypothesis, Bunnett-Olsen parameter.

Isotopic Effect

Theory of isotopic effects; Primary and secondary kinetic isotope effects. Heavy atom isotope effects, Tunneling effect. Kinetic solvent effects.

Solvent Effect

Qualitative theory of influence of solvent on reaction rate; Solvent effect in terms of dielectric constant, Grunwald - Weinstein parameter, Z and E values. Application of solvent polarity, Koppel - Palm treatment.

Unit-III

Nuclear Models

Shell model – magic numbers, salient features and merits; liquid drop model – analogy with liquid drop, merits, semi-empirical equation; Fermi gas model; collective model and optical model.

Nuclear Reactions

Nuclear fusion and fission; Nuclear fission – mass, energy and charge distribution of fission products; fission neutrons; liquid drop model.

Nuclear Reactors

Natural uranium reactors, classification of reactors – typical reactors, Breeder reactor.

Unit-III Radioactivity

General characteristics of radioactive decay and decay kinetics, measurement of radioactivity: Ionization chamber, electron pulse counters – variation of pulse size with voltage, Geiger-Muller counter, proportional counter and scintillation counters.

Applications of Radioactivity

Typical applications of radioisotopes as tracers; chemical investigation – reaction mechanism and structure determination; physicochemical applications – solubility of sparingly soluble and surface area of a powder; analytical applications – isotope dilution analysis and neutron activation analysis; age determination and medical applications.

LIST OF REFERENCE BOOKS

1. Chemical Kinetics, K.J. Laidler.
2. Chemical Kinetics, PaneteirShauchey.
3. Chemical Kinetics and Catalysis, Panchankov
4. Investigation of Reduction Rates and Mechanism of Reactions. Edward Lewis.
5. Correlation Analysis of Organic reactivity, John Shorter, Research Studies Press.
6. Molecular Mechanics, Burkert and Alinger, ACS Monograph.
7. Physical Organic Chemistry, N.S. Isaacs, ELBS, Longmann.

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M.Sc. CHEMISTRY

Semester IV

2023-24

Paper– IV Elective - D

MCH-404(D): POLYMER CHEMISTRY

Course Outcome (CO):

After completion of the course, the students would be able

- CO1: To explain the mechanism of various types of polymerization and conditions in homogenous and heterogenous systems.
- CO2: To understand and discuss the kinetics and statistics in different kinds of polymerization.
- CO3: To know about the structure and its effect on properties of polymer.
- CO4: To have an insight into various polymer processing techniques, characterization, analysis and testing methods of polymer

M.Sc. Chemistry

Semester IV

2023-24

Paper– IV Elective - D

MCH-404(D): POLYMER CHEMISTRY

Max. Marks 80

Min. Marks 16

Unit – I Mechanism of Polymerization

Basic concepts- Monomers, repeat units, degree of polymerization. Linear, branched and network polymers. Classification of polymers. Polymerization: Mechanism of condensation polymerization, mechanism of addition polymerization – free radical chain, cationic, anionic, coordination and mechanism of copolymerization. Polymerization conditions and polymer reactions. Polymerization in homogeneous and heterogeneous systems.

Unit - II Kinetics and Statistics of Polymerization

Kinetics and statistics of stepwise polymerization – reactivity and molecular size, kinetics and statistics, molecular weight control. Kinetics of free radical chain polymerization, equation for kinetic chain length, degree of polymerization and chain transfer; Kinetics of cationic polymerization; kinetics of anionic polymerization. Kinetics of heterogeneous polymerization using Ziegler Natta catalysts.

Unit - III Structure and Properties

Morphology and order in crystalline polymers - configurations of polymer chains. Crystal structures of polymers. Polymer structure and physical properties- crystalline melting point T_m - melting points of homogenous series, effect of chain flexibility and other steric factors, entropy and heat of fusion. The glass transition temperature, T_g - relationship between T_m and T_g , effects of molecular weight, diluents, chemical structure, chain topology, branching and cross linking.

Unit - IV Polymer Processing

Plastics, elastomers and fibers, compounding. Processing techniques: Calendering, die casting, rotational casting, film casting, injection moulding, blow moulding, extrusion moulding, thermoforming, foaming, reinforcing and fiber spinning.

Polymer Characterization

Polymer solutions – Criteria of polymer solubility, thermodynamics of polymer solution – ideal solution, entropy, heat and free energy of mixing.

Analysis and testing of polymers - chemical, analysis of polymers, spectroscopic methods, X-ray diffraction study, microscopy, thermal analysis and physical testing tensile strength. Fatigue, impact, tear resistance, hardness and abrasion resistance.

LIST OF REFERENCE BOOKS

1. Polymer Science, Gowarikar, Vishwanathan, Sridhar, Willey Eastern.
2. Textbook of Polymer Science, F.W. Billmeyer, Jr. Wiley
3. Contemporary Polymer Chemistry, Alcock and Lambe, Prentice Hall.
4. Physics and Chemistry of Polymers, J.M.G. Cowic, Blackie, Acadand Professional.
5. Funictonal Monomers and Polymers, K. Takemoto, Y. Inaki and R.M. Ottanbrite.

Question Paper Format and Distribution of Marks for PG Semester Examination

Question paper format for the Post-Graduate Examination has been revised from the Session 20 22-23. The revised format will be applicable for all the question papers of Semester I, II, III & IV. The following are the main points of the new format:

1. The question paper will be of **80 marks**
2. Questions will be asked Unit-wise in each question paper.
3. From each Unit, the questions will be asked as follows :

- Q.1 Very short answer type question
(Answer in one or two sentences) (02 Marks)
- Q.2 Very short answer type question
(Answer in one or two sentences) (02 Marks)
- Q.3 Short answer type question (Answer in 200-250 words) (04 Marks)
- Q.4 Long answer type questions (Answer in 400-450 words) (12 Marks)

Type of Question	Unit-I	Unit-II	Unit-III	Unit-IV
Very Short (2 Questions) (Maximum two sentences)	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks
Short (1 Question) 200-250 words	1 x 4 = 4 Marks	1 x 4 = 4 Marks	1 x 4 = 4 Marks	1 x 4 = 4 Marks
Long answer (1 Question) 400-450 words	1 x 12 = 12 Marks	1 x 12 = 12 Marks	1 x 12 = 12 Marks	1 x 12 = 12 Marks

Note:

1. Question no. 1 and Question 2 will be compulsory.
2. Question no. 3 and 4 will consist of 2 optional questions of which one has to be attempted.
3. As mentioned above, two compulsory very short answer type questions (2+2 marks), one short answer type question with internal choice (4 marks) and one long answer type question with internal choice (12 marks) will be asked from each unit.

Thus there will be questions of 20 marks from each unit and of total 80 marks from all the four units of the syllabus/syllabi.

The syllabus has been approved for the session 2023-24 & 2024-25

M.Sc. Chemistry
[Fourth Semester]
2024-25

Course I
PROJECT WORK

Max. Marks 100

Each student will be allotted one project of 100 marks. The project can be either theoretical or experimental.

Distribution of marks:-

Project work	-	60
Presentation	-	20
Viva	-	20
Total	-	100

**M.Sc. Chemistry [Fourth Semester]
2024-25**

**Course II:
LABORATORY COURSE
Laboratory Course II (A) - Practical**

MAJOR EXPERIMENTS

Max. Marks 100

Analysis of alloys, ores and minerals

- (i.) Ni alloy
- (ii.) Cu, Ni, Zn alloy
- (iii.) Steel
- (iv.) Solder metals
- (v.) Gun metals
- (vi.) Types metals
- (vii.) Coin analysis

Inorganic Reaction Mechanism

- (i) Kinetics and mechanism of following reactions
- (ii) Substitution reactions in octahedral complexes (acid hydrolysis and base hydrolysis)
- (iii) Redox reaction in octahedral complexes
- (iii) Isomerisation reaction of octahedral.

MINOR EXPERIMENTS

Bio-Inorganic Chemistry

- (i) Extraction of chlorophyll from green leaves of students choice. Separation of chlorophylls and their electronic spectral study,
- (ii) Complexation study of Cu(II) ion biologically important amino acids

Inorganic Photochemistry

- (i) Synthesis of potassium ferrioxalate and determination of the intensity of radiation,
- (ii) Photo - oxidation of oxalic by UO_2^+ sensitization.
- (iii) Photodecomposition of H I. Determination of its quantum yield.

Complex preparations; theoretical study of structure and their identification by spectral analysis

- (i) Cuprous mercuric Iodide
- (ii) Tetra amine cupric sulphate
- (iii) Ammonium hexachlorostannate

M.Sc. Chemistry
[Fourth Semester]
2024-25

Laboratory Course II (B) – Practical
MAJOR EXPERIMENTS

Max.marks 100

Multi – step synthesis of organic compounds

- (i) Beckmann rearrangement :Benzanilide from benzene (Benzene→Benzophenone →Benzophenoneoxime→Benzanilide)
- (ii) Benzilic Acid rearrangement :Benzilic acid from benzoin (Benzoin→Benzil→Benzilic acid.
- (iii) Skraup's synthesis (Synthesis of heterocyclic compounds)
Quinoline from o- Amino Phenol.
- (iv) p-Bromoaniline from Aniline (Aniline→Acetanilide→ Bromoacetanilide →Bromoaniline)
- (v) p -Nitroacetanilide from Acetanilide (Aniline→ Acetanilide → Nitroacetanilide → p-Nitroaniline)
- (vi) m-Nitroaniline from benzene (Benzene→ Nitrobenzenen→ dinitrobenzene →m-nitroaniline)
- (vii) Acridone from Anthranilic acid (Anthranilic acid→ o-Chlorobenzoicacid→N-Phenylanthranilic acid → Acridone)
- (viii) Enzymatic Synthesis
Enzymatic reduction: Reduction of ethylacetoacetate using Baker's yeast to yield enantiomeric excess of S (+) ethyl - 3 -hydroxybutanone and determine its optical activity.

MINOR EXPERIMENTS

Spectrophotometric (UV/ Vis) estimations

- (i) Cholesterol
- (ii) Ascorbic acid
- (iii) Aspirin
- (iv) Iron in vitamin tablets

M.Sc. Chemistry
[Fourth Semester]
2024-25

Laboratory Course II (C) - Practical






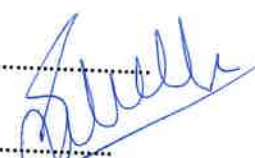
MAJOR EXPERIMENTS

M. M. 100

1. To study the influence of ionic strength on the reaction between potassium persulphate and iodide.
2. To study the Kinetics of reaction between H_2O_2 and KI .
3. To study the kinetics of reaction between sodium formate and iodine by
 - a. Volumetric method
 - b. Conductometric method
4. To study the kinetics of reaction between acetone and iodine.
5. To study the various activation parameters.
6. To study some simple enzyme catalysed reaction.

MINOR EXPERIMENTS

1. To study the effect of surfactant on oxidation of dye / hydrolysis reaction.
2. To study the effect of solvent on oxidation of dye / hydrolysis reaction.
3. To study the kinetics of decomposition of complex formed between sodium sulphate and sodium nitroprusside.
4. To determine colorimetrically the order of decomposition of complex of ceric ion and N-phenyl anthranilic acid.
5. To study the effect of transition metal ion on the rate of hydrolysis/ oxidation reaction.
7. To examine the substituent effect.

Name and Signatures	Departmental members (Name and Signatures)
Chairperson /H.O.D	1. 
Subject Expert 	2. 
(University Nominee)	3.
Subject Expert..... 	4.
Subject Expert.....	5. 
Representative (Industry)	6.
Representative 	7.
(Alumni)	8.
Representative (Professor Science Faculty Other Dept.)	9.

The syllabus for M.Sc. Chemistry is hereby approved for the sessions 2023-24 and 2024-25

Name and Signatures	Departmental members Name and Signatures
Chairperson /H.O.D <i>Aruni</i>	1. <i>Deepika</i>
Subject Expert (University Nominee)	2.
Subject Expert..... <i>H. H. Mahabey</i>	3. <i>Mukesh</i>
Subject Expert..... <i>S. J.</i>	4. <i>MT</i>
Subject Expert.....	5. <i>Divastar</i>
Representative (Industry)	6. <i>Shree</i>
Representative <i>Ugawar</i> (Alumni)	7. <i>Shree</i>
Representative (Professor Science Faculty Other Dept.)	8. <i>Shree</i>
	9. <i>Ugawar</i>
	10. <i>Ugawar</i>
	11.
	12.