

**DR. BHIM RAO AMBEDKAR UNIVERSITY
AGRA**



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in HEP file*

**NATIONAL EDUCATION POLICY-2020
STRUCTURE AND SYLLABUS OF CHEMISTRY**

For

**Post Graduate (PG) Programme
Effective From Academic Session 2025-26**

DR. BHIM RAO AMBEDKAR UNIVERSITY, AGRA

BOARD OF STUDIES – CHEMISTRY MINUTES OF MEETING

Meeting of Board of Studies of Chemistry was held on 10/09/2025 at Academic Department Paliwal Park Dr.B.R.Ambedkar University , Agra, on the agenda: Inclusion of Chemistry Practicals in VIIth to Xth Semesters of P.G.Classes " Following members attended the meeting –

S. No.	NAME	DESIGNATION	AFFILIATION
MEMBERS OF BOARD OF STUDIES			
	Dr.Shalini Pandey	Convener of BOS	Department of Chemistry, Shri Chitragupt College, Mainpuri.
1.	Km. Rita Dixit	Associate Professor	Department of Chemistry, M.G.B.V.(PG) College, Firojabad
2.	Prof. Lalit Pal Singh,	Professor	Department of Chemistry, R.B. S. College, Agra
3.	Prof. Harikant	Professor	Department of Chemistry, R.B.S.College, Agra
4.	Dr.Neelesh Pandey	Associate Professor	Department of Chemistry, B.S.A. College, Mathura
5.	Prof. Kalpana Chaturvedi	Professor	Department of Chemistry, Agra College, Agra
6.	Prof. Nisha Rathore	Professor	Department of Chemistry, K.R.P.G.College, Mathura

All the above members recommended the following:

In the Fourth & Fifth Year of Higher Education, the currently running M.Sc. Chemistry Syllabus will remain applicable with certain modifications in its Structure and Syllabus.

Chemistry Practicals will be included in all four semesters (VIIth to Xth) of the P.G. Chemistry programme , effective from the upcoming academic session (2025-26).

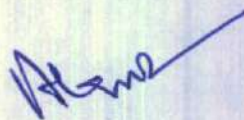
The distribution of credits between theory and practical will be reorganized to maintain a balanced academic load across all semesters.

All the above amendments will be applicable only to the students admitted in the Academic Session 2025-26 in Semester VIIth of Higher Education. All other students will complete their courses as per the previous rules.

Minor Papers related to the Syllabus of Chemistry, that can be opted through Swayam Portal were also discussed.

Purpose of the Program

The purpose of the M.Sc. Program at the University is to provide the key knowledge of various disciplines in Chemistry and on Advances in this field. To prepare students for careers as professional in various Research Institutes and Industries.

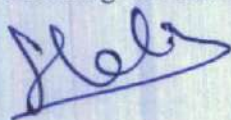


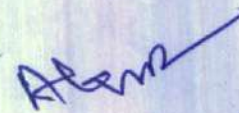
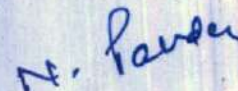
N. Pandey



STRUCTURE OF CHEMISTRY COURSE IN FOURTH YEAR OF HIGHER EDUCATION FOR DEGREE IN BACHELOR(Research) OF SCIENCE IN CHEMISTRY					
YEAR	SEMESTER	COURSE CODE	PAPER TITLE	PAPER NATURE	CREDIT
FOURTH	VII	B020701T	Computer for chemists	Theory	4
		B020702T	Inorganic Chemistry	Theory	4
		B020703T	Organic Chemistry	Theory	4
		B020704T	Physical Chemistry	Theory	4
		B020705T	Adulterant in Foods (Minor For Other Faculty)	Theory	4
		B020706P	Chemistry Practical	Practical	4
		B020707R	Dissertation in Chemistry*	Research	
	VIII	B020801T	Group Theory and Spectroscopy	Theory	4
		B020802T	Bio-Inorganic Chemistry	Theory	4
		B020803T	Bio-Physical Chemistry	Theory	4
		B020804T	Spectroscopic Methods of Analysis	Theory	4
		B020805P	Chemistry Practical	Practical	4
		B020806R	Dissertation in Chemistry*	Research	8
Dissertation In Chemistry of both the Semesters (VII and VIII) will be jointly evaluated at the end of the Semester VIII as per University Guidelines					

Students of Science Faculty may choose MINOR paper from Faculty of Commerce/Arts, Humanities and Social Sciences /Languages/Fine Art and Performing Art/ Education/ Rural Science.

SEMESTER-VII

B020701T

COMPUTER FOR CHEMISTS

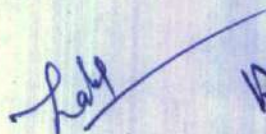
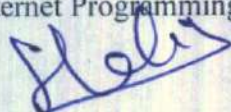
M.M. 75

Credits-04

- Unit I:** History of Development of Computer, Classification of Computers, Generation of Computers, General Awareness of Computer Hardware – CPU and other peripheral devices, Input, Output and Auxiliary Storage Devices
- Unit II:** Softwares and their types(System Software & Application Software), Computer Language and their types (Low Level & High Level Languages), Operating System, requirement of OS, Types of OS : Single User and Multi-user OS with example
- Unit III:** **Computer and Internet 1:**What is Networking, Different types of Networking (LAN, WAN and MAN), Optical Fibres, Ethernet, Network Interface Card, Hub, Switch, Routers, Modems, Protocols TCP/IP, Internet Service Providers (ISP), Web Search Engine, Intranet, Difference between Internet & Intranet
- Unit IV:** Educational and Research Resources on Net for Chemical Sciences, Online Tutorials and Lectures Virtual Labs, Electronic Journals, E-books, Digital Libraries, Use of Chemdraws like tools for Chemical Education.
- Unit V:** MS Word, facilities in MS Word, MS- Excel, Facilities in MS Excel,MS PowerPoint, Oral Presentations using visual aids such as Power Point etc. Adobe Photoshop (Introductory), Multimedia, Digital Arts.

Books Suggested:

1. Computer Fundamentals,(Concepts,systems and Applications),Pradeep K. Sinha,PritiSinha, BPB Publications
2. Computer Basics,G. Manjunath.Vasan Publications
3. Fundamentals of Computers,E. BalagurusamyE. Balagurusamy, McGraw Hill Education
4. Fundamentals of Internet Programming, Mir Shehzad Ahmad, Toronto Academic Press



N. Pandey

Unit I: Mechanism of Inorganic Reactions:

Mechanisms of redox reactions of metal complexes, Substitution reactions of octahedral and square planar complexes in aqueous solutions, cis-and trans effects.

Unit II: Nuclear Chemistry:

Radioactive decay and equilibrium, Nuclear reactions and its types, Q-value, cross section of reactions, chemical effects of nuclear transformation. Nuclear fission–Fission products, Fission Yield and Nuclear Reactors, Nuclear Fusion and Stellar energy.

Radioactive techniques –(1) Tracer techniques (neutron activation analysis),
(2) Counter techniques such as G.M., Ionization and proportional counters.

Unit III: Metal clusters:

Cluster compounds; Introduction, classification of clusters, Diborane- structure and properties. Higher boranes- Introduction, classification, STYX rule, classification and structure of carboranes. Metalloboranes and metallocarboranes, isolobal analogy. Metal carbonyl and metal halide clusters- Introduction, classification and structures. Zintl ions, Wade's rule, LNCC & HNCC, Capping rule

Unit IV: Chemistry of Macrocycles :

Complexes of crown ethers, porphyrins and cryptands, their synthesis, important characteristics With special reference to hole size and importance in biological systems.

Unit V: Metal II-Acid Complexes

Metal Carbonyls: Structure and bonding, vibrational spectra of metal carbonyls for bonding and structural elucidations, important reactions of metal carbonyls, preparation, bonding, structure and important reactions of transition metal nitrosyls,

Books Suggested:

- 1, Advanced Inorganic Chemistry, F.A. Cotton and Wilkinson , John Wiley.
- 2 .Inorganic Chemistry, J.E. Huhey, Harpes& Row.
3. Inorganic Electronic Spectroscopy, A.B.P. Lever, Elsevier.
4. Comprehensive Coordination Chemistry Eds G. Wilkinson, R.D. Gillars and J.AMcCleverty, Pergamo
5. Nuclear Reactions R. Singh & S. N. Mukherjee, New Age International. New Delhi.

Credits-04

Unit-I: (a) **Delocalized chemical bonding** –conjugation, cross conjugation, resonance, hyperconjugation, tautomerism.

(b) **Reaction intermediates-** Generation, geometry, stability and reactions of carbocations, carbanions, free radicals, carbenes, nitrenes and benzyne.

Unit-II: Substitution reactions:

Electrophilic substitution reactions in aromatic and aliphatic compounds with their mechanism, Nucleophilic aliphatic and aromatic substitutions reactions. SN^1 , SN^2 mechanisms, neighbouring group participation in aliphatic nucleophilic substitutions, Factors affecting the nucleophilic substitution reactions

Unit- III: Elimination reactions:

The E^1 , E^2 , E^1CB mechanisms, orientation in E^2 reactions (Saytzeff and Hoffman), Pyrolytic syn-elimination, Stereochemistry of elimination reaction.

Unit- IV: Common Organic Reaction and Mechanism

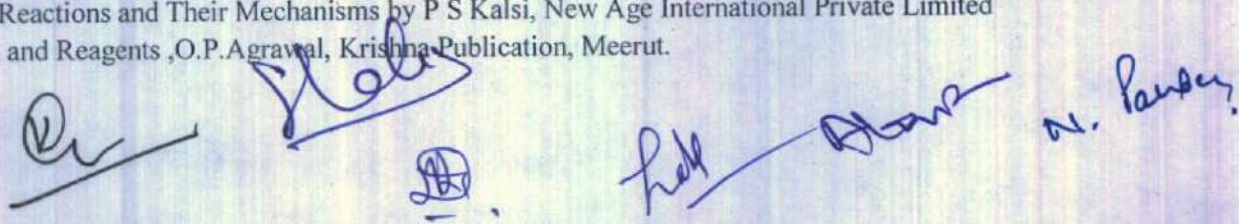
Aldol, Perkin, Dieckmann condensation, Reformatsky, Benzoin, Wittig, Mannich reaction, Michael reaction, Diels-Alder reaction, Knoevenagel reaction.

Unit- V: Reagents in Organic Synthesis:

Lithium aluminium hydride, Sodium borohydride, lithium dialkylcuprate, lithium di-isopropylamine, Grignard reagents, mono & dialkylboranes, 1,3-Dithiane, m-chloroperoxybenzoic acid, Osmium tetroxide. dicyclohexylcarbodiimide, N- bromosuccinimide.

Books Suggested:

1. Organic Reagents and Name Reactions Samuel Delvin, Ivy Publishing House
2. Experiments and Techniques in Organic Chemistry, D. Pasto. C. Johnson and M. Miller, Prentice Hall.
3. Organic Reaction Mechanisms, V.K. Ahluwalia & Rakesh K. Parashar, Narosa Publishing House. .
4. Systematic qualitative Organic Analysis, H. Middleton, Edward Arnold.
5. Organic Reaction Mechanisms by Raj K. Bansal, New Age International Private Limited
6. Organic Reactions and Their Mechanisms by P S Kalsi, New Age International Private Limited
7. Reaction and Reagents, O.P. Agrawal, Krishna Publication, Meerut.



Unit-I: Quantum Chemistry:

Approximation Method: The variation theorem, Linear variation principles, Perturbation theory (First order and non degenerates), application of variation method and perturbation theory to be helium molecule.

Unit-II: Thermodynamics:

Chemical thermodynamics, second law of thermodynamics, Gibbs Helmholtz equation, Direction of reaction, Third law of Thermodynamics, Concept of Entropy at absolute zero, Nernst heat equation.

Statistical thermodynamics-Partition functions, Application of partition function to determine chemical equilibrium and equilibrium constant, Bose-Einstein and Fermi-Dirac statistics basic ideas.

Unit-III: Chemical Dynamics: Methods of determining rate laws, collision theory of reaction rates, steric factor, activated complex theory, Arrhenius equation and the activated complex theory, ionic reaction, kinetic salt effects, steady state kinetics, kinetics and thermodynamic control of reaction, treatment of unimolecular reactions. Dynamic chain (hydrogen-bromine reaction, pyrolysis of acetaldehyde decomposition of ethane, Photochemical (hydrogen-bromine and hydrogen-chlorine reactions)

Unit-IV: Micelles: Surface active agents, classification of surface active agents, micellization, hydrophobic interaction, critical micellar concentration (CMC), factor-affecting the CMC of surfactants.

Macromolecules: Polymer-definition, types of polymers, electrically conducting, fire resistant, liquid crystals polymers, kinetics of polymerization, mechanism of polymerization.

Unit-V: Electrochemistry: Electrochemistry of solution, Debye-Huckel-Onsager treatment and its extension, ion solvent interaction, Debye-Huckel limiting law, thermodynamic of electrified interface equation, over potential, exchange current density.

Book Suggested:

1. Physical chemistry, P.W. Atkins, ELBS
2. Introduction to Quantum chemistry, A.K. Chandra, Tata McGraw Hill.
3. Quantum chemistry, Era N Levine, Prentice Hall.
4. Coulson's Valence, R. McWeeny, ELBS.
5. Chemical Kinetics, K.J. Laidler, McGraw- Hill.
6. Kinetics and mechanism of chemical transformations, J. Rajaraman and J. Kuriacose, McMillan.
7. Micelles, Theoretical and applied aspects, Y. Moroi, Plenum.
8. Modern electrochemistry, Vol. I and Vol. II, J.O.M. Bockris and A.K.N. Reddy, Plenum.

Unit-1 Introduction

Food and food for life, adulteration, types of adulteration, identification of adulterants. adulteration, problems, Common adulterants, in food and their injurious effects on health.

Unit-II Detection of adulterants

Qualitative Analysis: Qualitative macro,semi-micro and micro techniques involving wet chemical tests, flame Tests.etc.,microscopic examinations .

Quantitative Analysis: Titrametric and gravimetric methods, instrumental methods.

Unit-III Materials to be analysed

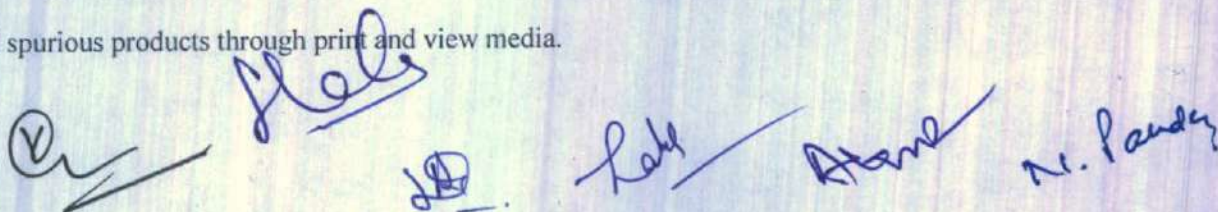
Milk analysis; detection of added water, neutralizers. Hydrogen peroxide, formalin, sugar, urea, ammonium sulphate, salt, pulverized soap, detergents, skim milk powder,vegetable fat, benzoic acid, salicylic acid, borax, boric acid and buffalo milk in cow's milk.

Khoya and Sweet analysis; Detection of starch(maida etc.) aluminium foil replacing silver foil in sweets, Detection of washing powder in ice cream.

Spice analysis ; detection of added starch, lead chromate, Metanil yellow in turmeric powder, powdered dung in coriander powder, identification of artificially coloured foreign seeds shown as cumin seed, poppy seed and black pepper.

Unit-IV False labeling and fake products in food packets; How to read a food label, elements of a food label, list of ingredients, terms used in food label, market survey and analysis of packaged products/materials. Hazards of reckless use of faulty food preservatives in food products.

Unit-V Creation of public awareness; Dissemination of information about the "food safety and standard (Packaging and Labelling) Regulations, Act 2011".Creation of consumer awareness for checking food adulteration and about fake and spurious products through print and view media.



INORGANIC CHEMISTRY**Inorganic Preparations:**

[25]

- (i) Reineckel Salt / Ammoniumdiamminetetraethiocyanatochromate(II) $\text{NH}_4[\text{Cr}(\text{NH}_3)_2(\text{SCN})_4]$
- (ii) Tetraamine Cupric Sulphate $\{\text{Cu}(\text{NH}_3)_4\}\text{SO}_4 \cdot \text{H}_2\text{O}$
- (iii) Chrome Alum
- (iv) Aluminium Chloride Hexahydrate
- (v) Nickel Dimethyl Glyoxime $[\text{Ni}(\text{dmg})_2]$
- (vi) Sodium Cobalt Nitrate
- (vii) Potassium Trioxalato Ferrate (III), $\text{K}_3[\text{Fe}(\text{C}_2\text{O}_4)_3]$
- (viii) *Cis*-Potassium DioxalatoDiaqua Chromate
- (ix) *Trans*-Potassium DioxalatoDiaqua Chromate $\text{K}[\text{Cr}(\text{C}_2\text{O}_4)(\text{H}_2\text{O})_2] \cdot 2\text{H}_2\text{O}$
- (x) Prussian Blue/Turnbull's Blue $\text{KFe}^{\text{III}}[\text{Fe}^{\text{II}}(\text{CN})_6]$
- (xi) Hexaamminecobalt(III)hexanitritocobaltate(III), $[\text{Co}(\text{NH}_3)_6][\text{Co}(\text{NO}_2)_6]$
- (xii) Tris(acetylacetonato)Manganese(III), $\text{Mn}(\text{acac})_3$

ORGANIC CHEMISTRY**Qualitative Analysis:**

[25]

Separation, Purification and Identification of compounds of binary organic mixtures (solid-solid, solid-liquid, liquid-liquid).

PHYSICAL CHEMISTRY

[25]

- (1) To estimate hardness of water by ethylene diamine tetra-acetic acid (EDTA).
- (2) To determine the specific reaction rate of the hydrolysis of methyl acetate/ ethyl acetate catalyzed by hydrogen ions at room temperature.
- (3) To titrate the given mixture of CO_3 and HCO_3 ions against a strong acid (HCl) using p-meter and to determine the strength of it.
- (4) Preparation of standard solution.
- (5) To test the validity of Lambert-Beer's Law (using methylene blue) and to determine

I. λ_{max} II. Molar extinction coefficient (ϵ)

RECORD

[15]

VIVA

[10]

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Shah

Shah

Shah *Atm* *Ac. Pandey*

SEMESTER-VIII

B020801T

GROUP THEORY AND SPECTROSCOPY

M.M.75

Credits-04

Unit-I: Symmetry elements and symmetry operation,

Symmetry elements and symmetry operations, point groups and their classification with examples, sub groups. General methods of assigning point groups to molecules with different shapes like Linear, Bent, Trigonal planar, Trigonal pyramidal, Tetrahedral, Trigonal bipyramidal. Octahedral, Square pyramidal, Square planar etc.

Unit-II Vibrational spectroscopy

Basic principles of vibrational spectroscopy of homonuclear and heteronuclear diatomic molecules. Selection rules for diatomic molecules based on Harmonic oscillator approximation. Force constants and amplitudes. Anharmonic oscillator. Overtones and combination bands. Vibration-rotation spectra, P, Q and R branches. Breakdown of the Born-Oppenheimer approximation.

Unit-III: Electronic Spectroscopy

Introduction, Franck-Condon Principle, theory involving electronic transition and applications, spectra of transition metal complexes, charge-transfer spectra.

Unit-IV: Atomic absorption spectroscopy: Introduction, principle, technique instrumentation and applications

Unit-V: Flame photometry:

Introduction, principle, technique, instrumentation, interference and applications

Books Suggested:

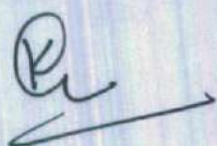
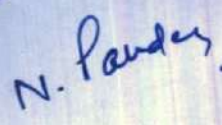
1. Modern spectroscopy, J.M. Hollas, John Willey.
2. Applied Electronic Spectroscopy For Chemical Analysis. Ed.H. Windawi and F.L. Ho, Wiley Interscience.
3. Introduction to Molecular Spectroscopy, G.M. Barrow, McGraw Hill.
4. Basic Principles of Spectroscopy, R. Chang. McGraw Hill.
5. Theory and Application of UV Spectroscopy, H.H. Jaffe and M. Orchin, IBHOxford.
6. Introduction of Photoelectron Spectroscopy, P.K. Ghosh, John Wiley.
7. Introduction of Magnetic Resonance, A. Carrington and A.D. MacLachlan, Harper and Row



- Unit-I:** **Metal ions in biology:**
Molecular mechanism of ion transport across membranes sodium and potassium pump, Essential and trace elements.
- Unit-II:** **Biomolecules:**
Structures and functions of metalloproteins in electron transport process -cytochromes and Iron-Sulphur proteins, DNA polymerisation, glucose storage.
- Unit-III:** **Bio-inorganic pigments:**
Chlorophyll, Photosystem-I and Photosystem-II in cleavage of water, haemoglobin, myoglobin, haemocyanin and hemerythrin. Storage of oxygen and its transport.
- Unit-IV:** **Bio-Chemistry:**
Biochemistry of calcium, copper and zinc. Biological Nitrogen fixation (Associative nitrogen fixation, symbiotic nitrogen fixation).
- Unit-V:** (a) Toxicity of metals (cadmium, mercury, lead, arsenic, copper). Deficiency of Metal ions
(b) Medicinal Inorganic chemistry- Metal ions and chelating agent in medicines. Drug activity, control of metal ion concentration, *In vivo* removal of metal ions, Antimicrobial drugs, anticancer drugs.

Books Suggested:

1. Progress in Inorganic Chemistry, vol. 18 and 38 Ed. J J. Lippard, Wiley.
2. Inorganic Biochemistry vol. I and II ed. G. L. Eichhorn, Elsevier.
3. Principles of Bioinorganic Chemistry, S. J. Lippard and J. M. Berg, University Science Books.

B020803T

BIO- PHYSICAL CHEMISTRY

M.M.75

Credits-04

Unit-I: Enzymes:

Introduction, nomenclature and classification, Fischer lock and key: Koshland and Induced hypothesis: Transition state theory, acid base catalysis, Nucleophilic displacement on phosphorous atom. Multiple displacement reaction and the coupling of ATP, cleavage to endergonic processes, Addition and Elimination reaction of enzyme catalyzed carboxylation and decarboxylation

Unit-II Coenzymes:

Apoenzymes, structure and biological function of coenzymes, production, purification of enzymes, methods of immobilization of enzyme activity, application of immobilized enzymes, clinical use of enzymes

Unit-III Bio-energetics:

Standard and free energy change in biochemical reactions, exergonic endergonic, hydrolysis of ATP, synthesis of ATP from ADP

Unit-IV Cell membranes and Transport of ions:

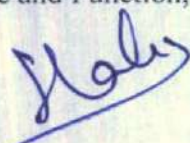
Structure and functions of cell membrane, ion transport through cell membrane, irreversible thermodynamics treatment of membrane transport, nerve conduction.

Unit-V Biopolymer Interactions:

Forces involved in biopolymer interactions, electrostatic charges and molecular expansion, hydrophobic forces, dispersion force interaction, multiple equilibrium and various types of binding processes in biological systems.

Books Suggested:

1. Understanding enzymes, Trevor Palmer, Prentice Hall.
2. Enzyme Mechanisms Ed, M. I. Page and A. Williams, RSC.
3. Fundamental of Enzymology, N. C. Price and L. Stevens, Oxford University Press.
4. Biochemistry, L. Stryer, W.H. Freeman.
5. Macromolecules: Structure and Function, F. Wold. Prentice Wall. 6. Biochemistry, Voet and Voet, John Wiley



 
N. Pandey

Unit I: Absorption spectroscopy

Lambert's Beer's Law and its limitations. Instrumentation. Selection rules, Types of electronic transitions, λ_{max} , chromophores and auxochromes, Bathochromic and Hypsochromic shifts, Intensity of absorption; Woodward rule for conjugated dienes and carbonyl compounds, applications.

Unit II: Raman Spectroscopy

Classical and quantum theories of Raman Effect, pure rotational vibrational and vibrational-rotational, Raman spectra, Selection rules, Mutual exclusion principle, Resonance Raman spectroscopy, Coherent anti stokes raman spectroscopy (CARS)

Unit III: Nuclear magnetic resonance spectroscopy (NMR):

Introduction, Theory, relaxation process and saturation, environmental effects on NMR spectra, chemical shift, spin-spin splitting, factors influencing coupling constant 'J', Spin decoupling, basic ideas about instrument, NMR studies of nuclei other than proton ^{13}C , FT-NMR advantages of FT-NMR, use of NMR in medical diagnostics.

Unit IV: Mass Spectrometry:

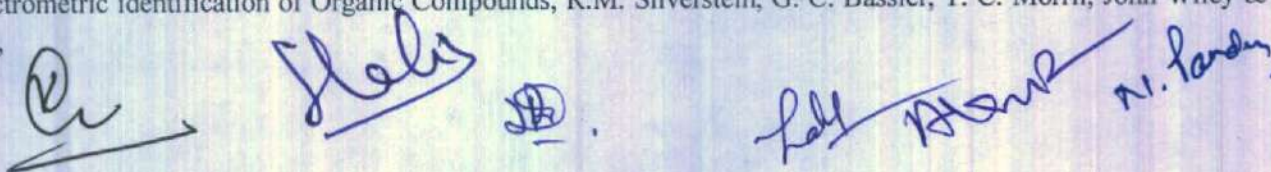
Introduction, molecule ion peak, base peak, isotopic abundance, metastable ions fragmentation mechanism of compounds containing C,H,O,N and halogen, McLafferty rearrangement, nitrogen rule and ring rule and applications.

Unit V: ESR Spectroscopy:

Introduction, principle, hyperfine splitting, and significance of g-value, determination of δ - value. Rules for hyperfine splitting and applications.

Books Suggested:

1. Modern spectroscopy, J.M. Hollas, John Willey.
2. Introduction to Molecular Spectroscopy, G.M. Barrow, McGraw Hill.
3. Basic Principles of Spectroscopy, R. Chang. McGraw Hill.
4. Theory and Application of UV Spectroscopy, H.H. Jaffe and M. Orchin, IBHOxford.
5. Introduction of Magnetic Resonance, A. Carrington and A.D. MacLachlan, Harper and Row.
6. Spectrometric identification of Organic Compounds, R.M. Silverstein, G. C. Bassler, T. C. Morrill, John Wiley & Sons,

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B020805P

M.Sc. CHEMISTRY Practical (Semester VIII)

M.M.100

Credits-04

INORGANIC CHEMISTRY

Quantitative Analysis:

[25]

Separation and determination of two metal ions Cu-Ni, Ni-Zn, Cu-Zn, etc. involving volumetric and gravimetric methods.

ORGANIC CHEMISTRY

Organic Synthesis:

[25]

Sulphonation, Diazotization, Aldol Condensation, Friedel Crafts Reaction, Cannizzaro Reaction, Acetylation, Benzoylation, Nitration.

PHYSICAL CHEMISTRY

[25]

- (1) To study the distribution co-efficient of benzoic acid between benzene and water.
- (2) To determine the distribution co-efficient of iodine between water and CCl_4 at room temperature.
- (3) To determine the amount of chloride ions present in the given KCl solution.
- (4) To determine nickel as dimethyl glyoximate complex spectrophotometrically.
- (5) Determination of proton coefficient between water and an organic solvent.

RECORD

[15]

VIVA

[10]

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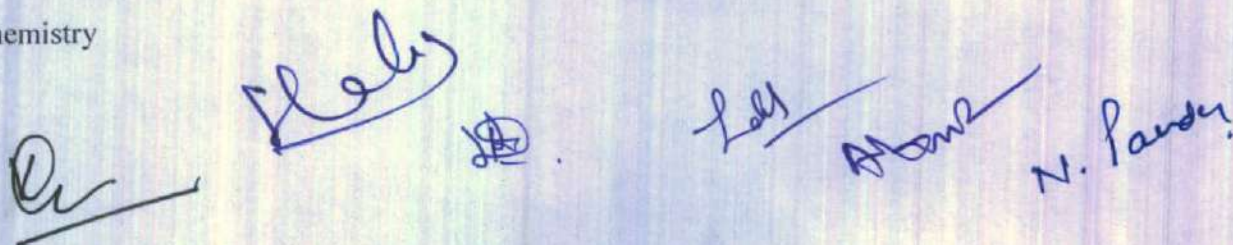
FOURTH YEAR (VII & VIII SEMESTER)

COURSE CODE	TITLE OF PAPER	CREDITS
B020707R	Dissertation in Chemistry	04
B020806R	Dissertation in Chemistry	04

RESEARCH PROJECT**M.M.100****Credits-08**

The research project is based on the following topics –

1. Coordination Chemistry
2. Macro Cyclic Chemistry
3. Green Chemistry
4. Nano Chemistry
5. Pesticide Chemistry
6. Polymer Chemistry
7. Polymer Nano Composite
8. Environmental Science
 - i. Air Pollution
 - ii. Soil Pollution
 - iii. Water Pollution
9. Natural Products
10. Synthetic Organic Chemistry
11. Drug Chemistry
12. Industrial Chemistry



STRUCTURE OF CHEMISTRY COURSE IN FIFTH YEAR OF HIGHER EDUCATION FOR

DEGREE IN MASTER OF SCIENCE IN CHEMISTRY

YEAR	SEMESTER	COURSE CODE	PAPER TITLE		PAPER NATURE	CREDI TS
FIFTH YEAR	IX	B020901T	Photo and Stereochemistry		Theory	4
		B020902T	Solid State Chemistry, surface Phenomenon and Chemical Equilibria		Theory	4
		B020903T	Coordination Chemistry		Theory	4
		B020904T	Basic Analytical Chemistry	Choose any One	Theory	4
		B020905T	Chemistry of Natural Products		Theory	4
		B020906T	Polymer Chemistry		Theory	4
		B020907P	Chemistry Practical		Practical	4
		B020908R	Research Project		Research	
	X	B021001T	Interdisciplinary Topics		Theory	4
		B021002T	Separation Techniques		Theory	4
		B021003T	Advanced Analytical Methods		Theory	4
		B021004T	Advanced Inorganic Chemistry	Choose any One	Theory	4
		B021005T	Advanced Organic Chemistry		Theory	4
		B021006T	Advanced Physical Chemistry		Theory	4
		B021007T	Chemistry Practical		Practical	4
		B021008T	Research Project		Research	8
PG Dissertation In Chemistry of both the Semesters (IX and X) will be jointly evaluated at the end of the Semester X as per University Guidelines						

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Alone

N. Pandey

Credits-04

- Unit-I:** General principles- Photochemical energy, Frank-Condon principle, Jablonski diagram, singlet and triplet states, photosensitization, quenching, quantum efficiency and quantum yield, energy transfer process in photochemistry, experimental methods of photochemistry.
- Unit-II:** Photochemistry of carbonyl compounds, Norrish type-I and Norrish type-II cleavages, Paterno-Buchi reactions, photoreductions, photochemistry of unsaturated systems like olefins, cis-trans isomerisation, dimerizations, hydrogen abstraction, addition. Photochemistry of enones-rearrangement of unsaturated ketones and cyclohexadienones.
- Unit-III:** A) Concept of chirality, elements of symmetry, R-S nomenclature, E-Z isomerisms. Interconversion of Fischer, Newman and Sawhorse projections
- B) Conformation and reactivity in acyclic compound (upto four C-atoms) and cycloalkanes (upto cyclohexane)
- C) Transannular effects in medium sized ring compounds.
- Unit-IV:** Molecular dissymmetry and chiroptical properties, linear and circularly polarized light, circular birefringences and circular dichroism, ORD and CD curves. Plain and Cotton effect curves and their applications. The octant rule and axial haloketone rule with applications
- Unit-V:** A) Racemates and their classification, method of resolution of racemates.
- B) Chemoselectivity, regioselectivity, stereoselective, stereospecific reactions and enantioselectivity with examples.

Books Suggested:

1. Fundamental of Photochemistry, K. K. Rohtagi-Mukherji, Wiley-Eastern.
2. Molecular Photochemistry, N.J. Turro, W. A. Benjamin.
3. Organic Photochemistry, J. Coxon and B. Halton, Cambridge University Press.
4. Photochemistry, R P. Kundall and A. Gilbert, Thomson Nelson
5. Stereoselective Synthesis: A Practical Approach M.Nogradi, VCH.

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**SOLID STATE CHEMISTRY, SURFACE PHENOMENON
AND CHEMICAL EQUILIBRIA.**

M.M.75

Credits-04

Unit-I : Solid State

Crystalline state of solids, unit cells and Bravais lattices, Miller indices, Diffraction of X-rays by crystalline solids, fundamental aspects of X-ray, electron and neutron diffraction studies

Unit-II: 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, structural imperfections and properties of solids such as ionic conductivity, diffusion, ferroelectric properties and luminescence, non-stoichiometry and defects.

Unit-III: 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, superconductors,

Unit-IV: Surface Phenomenon

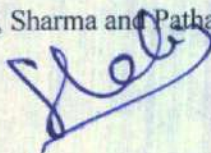
Surface tension, adsorption on solids, electrical phenomena at interfaces, including electrokinetic, micelles and reverse micelles: solubilization, micro-emulsion, application of photoelectron spectroscopy, ESCA and Auger spectroscopy to the study of surfaces.

Unit-V: Chemical Equilibria

Free energy and entropy of mixing, partial molar quantities, Gibbs- Duhem equation. Equilibrium constant, temperature- dependence of equilibrium constant, phase diagram of one- and two component systems, phase rule.

Books Suggested:

1. Solid State Chemistry and its Application, Anthony R. West, Wiley Publication, US
2. Solid State chemistry an Introduction, Lesley E. Smart and Elaine A. Moore, Taylor and Francis, London.
3. Principles of Physical Chemistry, Puri, Sharma and Pathania, Vishal Publishing, Delhi



N. Pandey

Unit I: Crystal field theory, crystal field splitting of d-orbitals in octahedral, tetrahedral and square planar complexes, crystal field stabilization energy (CFSE) in octahedral (weak and strong fields) and tetrahedral complexes, factor affecting CFSE and uses of CFSE, spectrochemical series.

Unit-II: (a) Applications of CFT in colour of transition metal complexes, limitations of CFT, valence bond theory and comparison of VBT and CFT.

(b) Ligand field theory, evidences of covalance and adjusted crystal field theory (ACFT), molecular orbital treatment of octahedral complexes and bonding, molecular orbitals for tetrahedral and square planar complexes, spin cross over coordination compounds.

Unit III: Coordination chemistry of transition metal ions, stability constants of complexes and their determination; stabilization of unusual oxidation states. Stereochemistry of coordination compounds. Jahn-Teller effect; Interpretation of electronic spectra including charge transfer spectra; nephelauxetic series, magnetism: Dia -, para -, ferro - and anti-ferromagnetism quenching of orbital angular moment, spin orbit coupling.

Unit-IV: Inorganic reaction mechanism; substitution reactions, trans effect and electron transfer reactions, photochemical reaction of chromium and ruthenium complexes. Fluxional molecules, iso- and heteropoly acid, metal clusters spin crossover in coordination compounds.

Unit-V: **Studies and Applications of Lanthanides and Actinides:**

Spectral and magnetic properties, Modern methods of separation of lanthanides and actinides. Organometallic compound of lanthanides, Applications of lanthanides and actinides compounds in industries. Use of lanthanides compounds as Shift's reagent.

Books Suggested: 1. Advanced Inorganic Chemistry, F.A. Cotton and Wilkinson, John Wiley.

2. Inorganic Chemistry, J.E. Huhey, Harpes & Row.

3. Inorganic Electronic Spectroscopy, A.B.P. Lever, Elsevier.

4. Comprehensive Coordination Chemistry Eds G. Wilkinson, R.D. Gillars and J.A. McCleverty, Pergamo

5. Synthesis and Characterization of Inorganic compounds, W.L. Jolly, Prentice Hall.

BO20904T

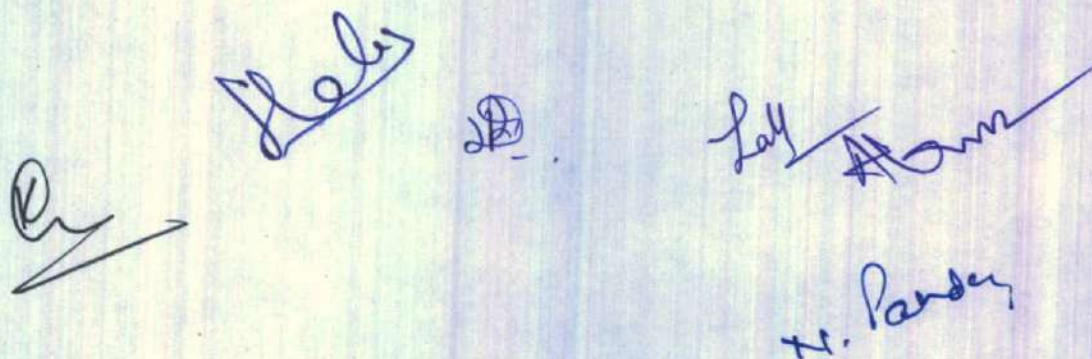
BASIC ANALYTICAL CHEMISTRY
(Elective-1)

M.M. 75
Credits-04

- Unit-I:** **Amperometry:** Introduction, principle, types of current, technique, amperometric titrations with DME, amperometric titrations with rotating platinum micro electrode, biamperometry, applications.
- Unit-II:** **Coulometry:** Introduction, constant current coulometry, controlled potential coulometry (principle and technique), types of coulometer, applications.
- Unit-III:** **Conductometry:** Introduction, principle, technique, electrolytic conductivity, measurement of electrolytic conductivity, conductometric titration, applications.
- Unit-IV:** **Polarography :** Introduction, principle, instrumentation, Ilkovic equation and its verification, half-wave potential and their Significance, D.M.E., residual current, migration current, diffusion current, limiting current, applications.
- Unit-V:** **Voltammetry :** (a) Introduction, principle, technique and applications
(b)Cyclic voltammetry and anodic stripping voltammetry.

Books Suggested

1. Instrumental Method of Chemical Analysis, B.K. Sharma, Krishna Prakashan, Media, Meerut.
2. Instrumental Method of Chemical Analysis, Gurdeep Chatwal, Himalaya Publication House, New Delhi.
3. Instrumental Method of Chemical Analysis, H. Kaur, Pragati Prakashan, New Delhi
4. Instrumental Method of Analysis, Willard, Meritt, Dean, Wadsworth Publishing Co. Inc, Australia
5. Basic Concept of analytical Chemistry, S.M. Khopkar, New Age International Publisher, New Delhi.
6. Fundamental of Analytical Chemistry, Holler and Crouch, Brooks Cole, US



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B020905T

CHEMISTRY OF NATURAL PRODUCTS

M.M.75

(Elective-2)

Credits-04

Unit-I: Plant Pigments:

Introduction, occurrence, general methods of structure determination, isolation and synthesis of apigenin, luteolin, vitexin, myrcetin, quercetin, lycopene, aureusin, cyanidin, hirostidin.

Unit-II: Alkaloids:

Introduction, classification, occurrence, isolation of alkaloids, general methods of determination of structure of alkaloids, Constitution and synthesis of cocaine, nicotine, atropine, morphine, reserpine. Biosynthesis of alkaloids.

Unit -III: Terpenoids and Carotenoids:

Introduction, classification, occurrence, general methods of structure determination, isoprene rule, constitution and synthesis of citral, zingiberene, farnesol, β - carotenoids, Biosynthesis of terpene.

Unit-IV: Steroids:

Introduction, classification, occurrence, isolation, constitution and synthesis of cholesterol, testosterone, progesterone, androsterone. Biosynthesis of steroid.

Unit-V: Antibiotics:

Introduction classification, synthesis of penicillin-G, penicillin-V, amoxycillin, tetracyclin, chloramphenicol, streptomycin.

Books Suggested:

1. Natural Products: Chemistry and Biological Significance J. Mann, R.S. Davidson, J.B. Hobbs, D.V. Banthrope an J.B. Harborne, Longman Essex
2. Organic Chemistry, Vol 2, I L. Finar. ELBS.
3. Rodd's Chemistry of Carbon Compounds, Ed, S. Coffe Elsevier.
4. Chemistry, Biological and Pharmacological Properties of Medicinal Plants from the Americas, Ed. Kurt Hostettmann, M.P. Gupta and A. Marston, Harwood Academic Publishers.
5. Introduction to Flavonoids, B.A. Bohm, Harwood Academic Publishers.
6. New Trends in Natural Product Chemistry, Atta-Ur-Rahman and M.I. Choudhary, Harwood Academic Publishers.
7. Insecticides of Natural Origin, SukhDev, Harwood Academic Publishers

N. Pandey

B020906T

POLYMER CHEMISTRY

(Elective-3)

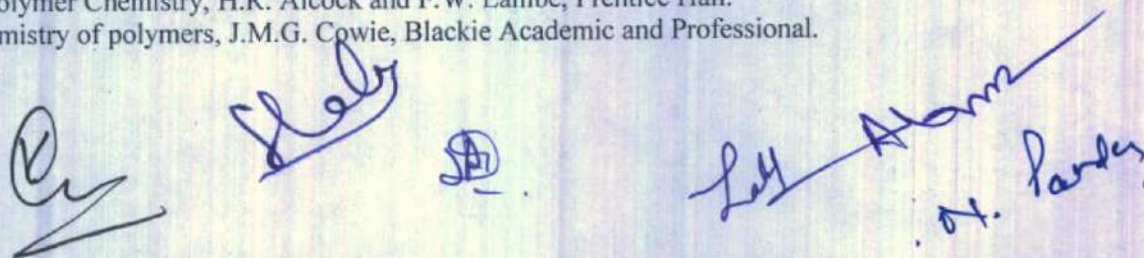
M.M.75

Credits-04

- Unit-I** Basics Importance of polymers basic concepts; Monomers, repeat units, degree of polymerization, Linear, branched and network polymers, classification of polymers. Polymerization : condensation, addition, radical chain-ionic and co-ordination and copolymerization. Polymerization conditions and polymer reactions. Polymerization in homogeneous and heterogeneous systems.
- Unit-II.** Polymer Characterization Polydispersion - Average molecular weight concept. Number, weight and viscosity average molecular weights. Polydispersity and molecular weight distribution. The practical significance of molecular weight. Measurement of molecular weights. Endgroup, viscosity, light scattering, osmotic and ultracentrifugation methods 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 abrasion resistance.
- Unit-III.** Structure and Properties Morphology and order in crystalline polymers-configurations of polymer chains. Crystal structures of polymers Morphology of crystalline polymers, strain-induced morphology, crystallization and melting. Polymer structure and physical properties crystalline melting point T_m . melting points of homogeneous 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, property requirements and polymer utilization
- Unit- IV.** Polymer Processing Plastics, Elastomers and fibres. Compounding Processing Techniques; Calendering, Die casting, rotational casting. Film casting, injection moulding, blow moulding, extrusion moulding, thermoforming, foaming, reinforcing and fibre spinning.
- Unit-V.** Properties of Commercial Polymers Polyethylene, polyvinyl chloride, polyamides, polyesters, phenolic resins, epoxy resins and silicon polymers. Functional polymers - Fire retarding polymers and electrically conducting polymers. Biomedical polymers-contact lens, dental polymers artificial heart, kidney, skin and blood cells.

Books Suggested:

1. Textbook of Polymer Science, F. W. Billmeyer. Jr. Wiley.
2. Polymer Science. V. R. Gowarikar, N.V. Viswanathan and J. Sreedhar, Wiley - Eastern.
3. Functional Monomers and Polymers, K. Takemoto, Y. Inaki and R.M. Otanbrite.
4. Contemporary Polymer Chemistry, H.R. Alcock and F.W. Lambe, Prentice Hall.
5. Physics and Chemistry of polymers, J.M.G. Cowie, Blackie Academic and Professional.

The block contains several handwritten signatures and initials in blue ink. From left to right, there is a signature that appears to be 'R...', a signature that looks like 'Shah', a circular stamp or initials 'SA', and a large signature that reads 'L. H. Allen' with 'Dr. Parker' written below it.

B020907P

M.Sc. Chemistry Practical (Semester IX)

M.M. 100

Credit- 4

M.Sc. (Inorganic Chemistry) Practical

[25]

1 Qualitative analysis

[15]

Qualitative analysis of an inorganic mixture of seven radicals including Tl, Mo.W, Te, Ti, Zr, Th, V and U in addition to the radical prescribed for the B.Sc. Course. Semi micro analysis is to be done.

2. Flame Photometric Determinations [10]

- (a) Sodium and Potassium when present together
- (b) Li/ Ca/ Ba/ Sr
- (c) Cd and Mg in tap water

M.Sc. (Organic Chemistry) Practical

[25]

1. Extraction of Organic compounds from natural resources: (One exercise)

[15]

- (i) Isolation of lactose from milk.
- (ii) Isolation of casein from milk.
- (iii) Isolation of caffeine from tea leaves.
- (iv) Isolation of β - carotene from carrot.
- (v) Isolation of lycopene from tomatoes.
- (vi) Isolation of cystine from human hair.
- (vii) Isolation of Nicotine from tobacco.

2. Paper chromatography, separation and Identification of sugars present in glucose, fructose, sucrose by paper chromatography and determination of R_f values / TLC.

[10]

M.Sc. (Physical Chemistry) Practical

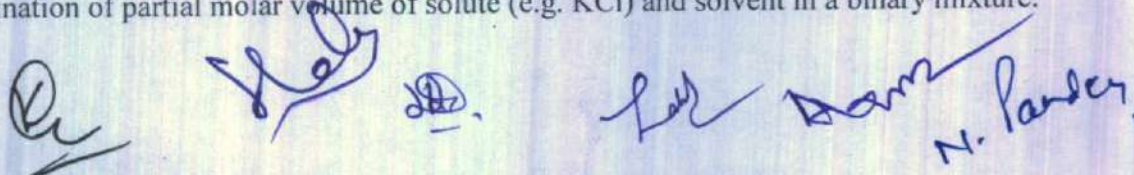
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A list of experiment under different headings are given below.

Typical experiments are to be selected from each type

1. Thermodynamics:

- (i) Determination of partial molar volume of solute (e.g. KCl) and solvent in a binary mixture.

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- (ii) Determination of the temperature dependence of the solubility of a compound in two solvents having similar intermolecular interaction (benzoic acid in water & in DMSO water mixture) and calculate the partial molar heat of solution.

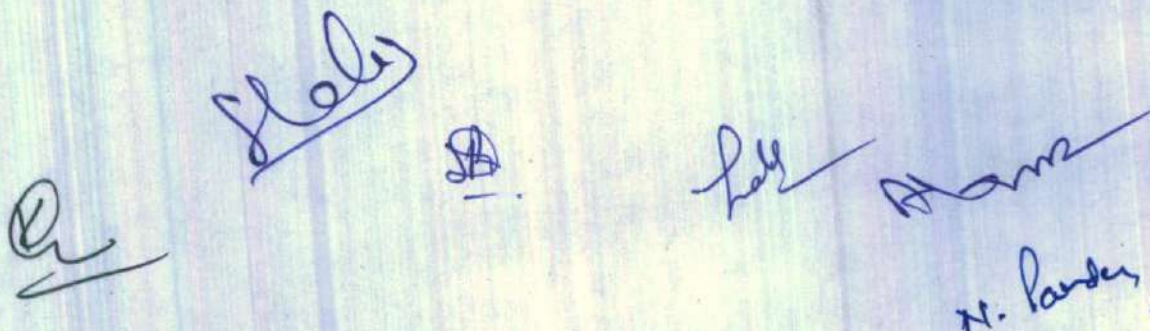
2. Spectroscopy:

- (i) Determination of pka of an indicator (e.g. Methyl red) in (a) aqueous and (b) micellar media
- (ii) Determination of stoichiometry and Stability constant of inorganic (e.g. ferric-salicylin acid) and organic (e.g. amine iodine) complexes.
- (iii) Characterization of the complexes by electronic and IR Spectral Data.

3. Electronics :

- (i) Measurements of resistance with multimeter and calculate the colour code.
- (ii) To measure the resistance of the given ammeter

RECORD [15]
VIVA [10]

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SEMESTER-X

B021001T

INTERDISCIPLINARY TOPICS

M.M. 75

Credits-04

Unit I: Chemistry in Nanoscience and Technology

Introduction to nanotechnology scope of applications, Synthesis of nanomaterials: Top-down processes: physical processes- milling, lithographic processes, machining, vapour phase condensation, plasma assisted deposition; Bottom- up processes; micro emulsion technique. Important nano materials (Nano optics, Nano magnetic, Nano electronics) carbon nanotubes (types, properties and applications)

Unit II: Catalysis and Green Chemistry:

Need for green chemistry, Twelve principles of Green Chemistry with their explanation and examples, Designing a green synthesis using these principles reactions (dry media reactions, microwave assisted reactions, solvent free reactions), Green chemistry in day to day life.

Unit III: Supra Molecular Chemistry:

Introduction, concept and language, molecular recognition, supra molecular reactivity and catalysis, transport processes and carrier design.

Unit IV: Environment and Atmosphere:

Environmental chemistry, chemical composition of atmosphere – particles, ions and radicals and their formation. Heat budget of the earth atmospheric system, vertical stability of atmosphere, chemical and photochemical reactions in atmosphere, smog formation, oxides of N, C, S, O and their effect, Green house effect, acid rain, air pollution controls and their chemistry.

Unit V: Environmental chemistry (Hydrosphere and soils):

The chemical composition of water bodies like lakes, streams, rivers, wetlands, etc. Hydrological cycle. Aquatic pollution – inorganic, organic, pesticide, agricultural, industrial and sewage, detergents, oil spills and oil pollutants, water quality parameters, water quality standards, purification and treatments of waste. Soil composition, micro and macro nutrients, pollution – fertilizers and pesticides, waste treatment.

Books Suggested:

- A Text Book of Nanoscience and Nanotechnology, McGraw Hill Education, New York
- Principles of Physical Chemistry, Puri, Sharma and Pathania, Vishal Publishing, Delhi
- New Trends in Green Chemistry, V.K. Ahluwalia, Springer, New York.
- Environmental Chemistry, H.Kaur, PragatiPrakashan, Meerut

UNIT I- Adsorption Chromatography:

Thin-layer chromatography (TLC): Principle, methodology selection of stationary and mobile phases- preparation of plates, spotting, development, identification and detection, measurement of RF values, Qualitative and quantitative applications.

UNIT II- Partition Chromatography:

Paper chromatography (PC): Theory and principle; techniques: one, two dimensional and circular PC, mechanism of separation, structure of cellulose and types of paper, methodology, sample preparation, choice of solvents, location of spots and measurement of RF value, factors affecting RF values, advantages and applications

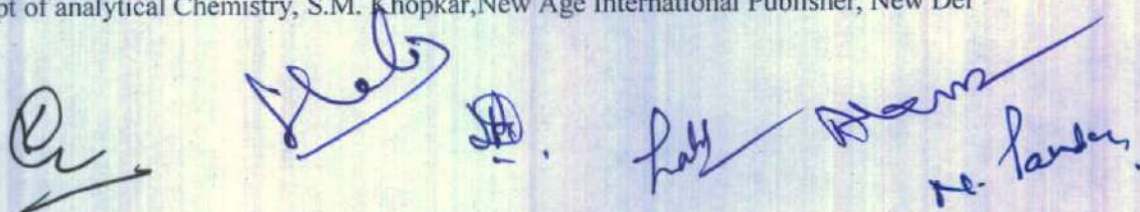
UNIT III- Gas Chromatography (GC): Principles, classification, experimental set up, special features, mechanism of separation procedures, advantages and disadvantages, and applications Plate theory, gas-solid and gas-liquid chromatography, Hyphenated technique. GC-MS and its applications.

UNIT IV- HPLC: Principles, classification, experimental set up, special features, mechanism of separation procedures, advantages and disadvantages, and applications Super critical fluid chromatography, gel permeation chromatography and molecular sieves.

UNIT V- Solvent Extraction: Principles, classification, experimental set up, special features, mechanism of separation procedures, advantages and disadvantages, and applications Extraction equilibria, partition coefficient and extraction coefficient, extraction by chelation and salivation and salvation; solid-phase extraction (SPE)

Books Suggested:

- 1 Instrumental Method of Chemical Analysis, B.K. Sharma, Krishna Prakashan, Media, Meerut
- 2 Instrumental Method of Chemical Analysis, Gurdeep Chatwal, Himalaya Publication House, New Delhi
- 3 Instrumental Method of Chemical Analysis, H. Kaur, Pragati Prakashan, New Delhi
- 4 Instrumental Method of Analysis, Willard, Meritt, Dean, Wadsworth Publishing Co. Inc, Australia
- 5 Basic Concept of analytical Chemistry, S.M. Khopkar, New Age International Publisher, New Del



- UNIT I:** **Data Analysis:** Errors, classification of errors, mean deviation and standard deviation, accuracy precision, rejection of measurements, confidence interval tests significance, minimization of errors and significant figures.
- UNIT II:** Principle, Instrumentation, Applications of Inductively Coupled Plasma(ICP) Spectroscopy.
- UNIT III:** Introduction, Principle, Instrumentation, Applications of X-Ray Diffraction (XRD)
- UNIT IV:** Principle, Instrumentation, Applications of Scanning Electron Microscopy (SEM) & TEM
- UNIT V:** Thermogravimetric analysis (TGA): Principle, instrumentation, factors affecting TGA curve, differential thermal Analysis (DTA), instrumentation of DTA and application of DTA, simultaneous study of TGA, DTA with examples.

Books Suggested:

1. Instrumental Method of Chemical Analysis, B.K. Sharma, Krishna Prakashan, Media, Meerut
2. Instrumental Method of Chemical Analysis, Gurdeep Chatwal, Himalaya Publication House, New Delhi
3. Instrumental Method of Chemical Analysis, H. Kaur, Pragati Prakashan, New Delhi
4. Instrumental Method of Analysis, Willard, Meritt, Dean, Wadsworth Publishing Co. Inc, Australia

Dr. Barker

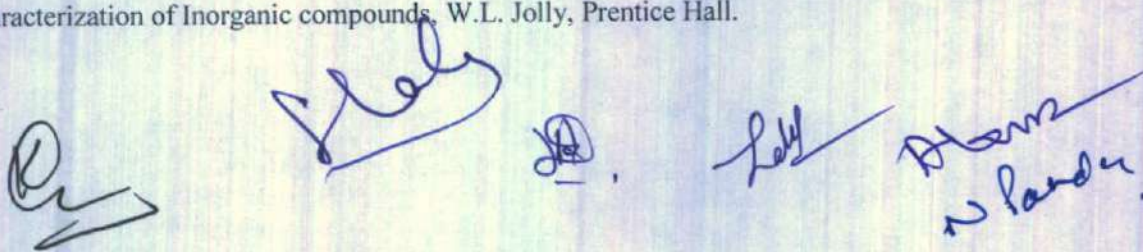
(Elective-1)

Credits-04

- Unit I-** (i) **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.
- (ii) Transition metal compounds with bonds to hydrogen.
- Unit II-** (i) Metal Storage Transport and Biomineralizations, Ferritin, Transferrin and Siderophores.
- (ii) **Calcium in Biology:** Calcium in living cells, Transport and regulation, molecular aspects of intramolecular processes, extracellular binding proteins.
- Unit III-** **Metalloenzymes:** Zinc enzymes- Carboxypeptidase and carbonic anhydrase, Iron enzymes- catalase, peroxidase and cytochrome P-450. Copper enzymes-superoxide dismutase molybdenum oxatransferase enzymes-xanthine oxidase. Coenzyme Vitamin B₁₂.
- Unit IV-** (i) **Metal Nucleic Acid Interactions:** Metal ions and Metal complex interaction, metal complexes- nucleic acids.
- (ii) **Metal in Medicine:** Metal deficiency and disease, toxic effect of metals, metals used for diagnosis and chemotherapy with particular reference to anticancer drugs.
- Unit V-** **Excited states of Metal Complexes:** Excited states of metal complexes comparison with organic compounds, electronically excited states of metal complexes, charge-transfer spectra, charge transfer excitations, methods for obtaining charge -transfer spectra.

Books Suggested:

1. Advanced Inorganic Chemistry, F.A. Cotton and Wilkinson, John Wiley.
2. Inorganic Chemistry, J.E. Huhey, Harpes & Row.
3. Comprehensive Coordination Chemistry Eds. Wilkinson, R.D. Gillars and J.A. McCleverty, Pergamon
4. Synthesis and Characterization of Inorganic compounds, W.L. Jolly, Prentice Hall.

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ADVANCED ORGANIC CHEMISTRY

M.M.75

(Elective-2)

Credits-04

Unit I: Heterocycles:

Introduction, classifications, IUPAC names of mono and bicyclic hetero aromatic compounds. Criteria of aromaticity in heterocycles(bond lengths, ring current, Empirical resonance energy, delocalization energy and Dewar resonance energy, diamagnetic susceptibility exaltations). Synthesis and reaction of benzo [b] and benzo [c], benzodiazoles and acridines, pyrazole, imidazole oxazole, thiazole, indole, pyrimidine.

Unit II: Common Organic Rearrangements and their mechanism:

Pinacol- Pinacolone, Wagner- Meerwein, BenzilBenzilic acid, Beckmann, Hoffmann, Curtius, Schmidt, Lossen, Sommelet-Hauser, Favorskii and Baeyer- Villiger rearrangement.

Unit III: Pericyclic Reactions:

Classification and examples, Woodward-Hofmann's Rule, Electrocyclic reaction, Cycloaddition reaction ([2+2] and [4+2] only) and Sigmatropic shifts [1,3]- shift, [1,5]-shift and [3,3]- shift (Cope rearrangement and Claisen rearrangement), FMO approach only.

Unit IV: Disconnection Approach

An introduction to synthons and synthetic equivalents, Guidelines for choosing disconnections, Functional Group Interconversion (FGI), use of protecting group in disconnection approach. Synthetic design: Introduction, Retrosynthetic approach, One and two group C-X disconnections, Synthesis of some organic molecules by disconnection approach

Unit V: Drugs

Antihistaminic Drugs:- Introduction, preparation and uses of Benadryl, dimenhydrinate, antergan, pyribenzamine.

Anti-inflammatory:- Introduction, Preparation and uses of Steroid and non-steroid drugs (Ibuprofen, mefenamic acid, diclofenac)

Antimalarials:- Synthesis of mepacrine, chloroquin, Pamaquin, paludrin.

Books Suggested:

1. Heterocyclic Chemistry Vol. 1-3, R. R. Gupta, M. Kumar and V. Gupta. Springer Verlag.
2. Heterocyclic Chemistry, J.A. Joule, K. Mills and G. F. Smith, Chapman and Hall.
3. Heterocyclic Chemistry, T. L. Gilchrist, Longman Scientific Technical
4. The Organic Chemistry of Drug Design and drug Action, R.B. Silverman, Academic Press.
5. Organic Synthesis, Jagdamba Singh, L D S Yadav, Jaya Singh, Pragati Prakashan

Unit I – Thin Film and Langmuir-Blodgett Films: Preparation techniques, evaporation/sputtering, chemical processes, MOCVD, Sol-gel, etc. Langmuir –Blodgett (LB) films, growth techniques, Photolithography, properties and application of thin & LB films.

Liquid Crystal: Mesomorphic behavior, thermotropic liquid crystal, positional order, bond orientation order nematic and smectic mesophases, smectic-nematic, transition and clearing temperature, homeotropic, planar and schlieren textures, twisted nematics, chiral nematics, molecular arrangement in smectic A and smectic C phases, Optical properties of liquid crystal, Dielectric description of ordering in liquid crystals.

Unit II – Polymeric Materials: Molecular shape, structure and configuration, crystallinity, stress-strain behaviour, thermal behaviour, polymer types and their application, conducting and ferro-electric polymers.

Unit III Ionic Conductors: Types of ionic conductors, mechanism of conduction, interstitial jumps (Frenkel); Vacancy, mechanism, diffusion superionic conductor, phase transitions and mechanism of conduction in super ionic conductors, examples and application of ionic conductors.

Unit IV – Theoretical and computation treatment of atoms and molecules, Hartree-Fock theory. Review of the principles of quantum mechanics, Born –oppenheimer approximation, Slater Condon rules. HartreeFock equation, Koopmans and Brillouin theories, Roothaan equation, Gaussian sets.

Unit V– General Properties of Liquids:

- (a) Liquids as dense gases, liquids as disordered solids, some thermodynamic relation, internal pressures and its significance in liquids. Equation of state, critical constants. Different types of intermolecular forces in liquids, different potential function for liquids, additivity of pair potential approximation.
- (b) A classical partition function for liquids, correspondence principle, configuration integral, configuration properties.

Book Suggested:

1. Physical chemistry, P.W. Atkins, ELBS
2. Advanced Physical Chemistry, Gurdeep Raj, Goel Publishing House, Meerut.
3. Principles of Physical Chemistry, Puri, Sharma and Pathania, Vishal Publishing, Delhi
4. Solid State Physics, N. W. Ashcroft and N.D. Mermin, Holt, Rinehart and Winston, New York, 1976.
5. Textbook of Polymer Science, F. W. Billmeyer, Jr. Wiley.



BQ21007P

M.Sc. Chemistry Practical (Semester X)

M.Sc. (Inorganic Chemistry) Practical

M.M.100

Credit 4

1. Gravimetric Analysis [30]

To separate and estimate Copper, Nickel, and Zinc in a mixed solution by Gravimetric method.

2. Spectrophotometric Determinations [25]

- (a) Fluoride/ Nitrite/ Phosphate
- (b) Copper-Ethylene diamine complex; slope ration method

3. Chromatographic Separations [20]

- (a) Cd and Zn
- (b) Zn and Mg
- (c) Thin-layer chromatography

Separation of Ni, Mn, Co & Zn Determination of R_f values.

Record [15]

Viva [10]

M.Sc. (Organic Chemistry) Practical

M.M.100

Credit 4

1. Multi- step synthesis of organic compounds: (One exercise) [20]

- (i) Preparation of p- Bromoaniline from Aniline (Bromination)
- (ii) Preparation of p-nitroaniline from Aniline (Nitration)
- (iii) Preparation of quinoline from aniline (Skraup Synthesis)
- (iv) Preparation of 2- phenyl indole from phenyl hydrazine (Fischer- Indole synthesis)
- (v) Benzoyl chloride to Benzaniline (Benzoylation)
- (vi) Benzene to Acetanilide (Acetylation) .

2. Green chemistry: (One exercise) [15]

- (i) Coenzyme catalysed benzoin condensation (Thiamine hydrolysed catalysed synthesis of benzene)
- (ii) Electrophilic aromatic substitution reaction-I (Nitration of Phenol)
- (iii) Radical coupling reaction (Preparation of 1,1-Bis-2-naphthol)

- (iv) Three component coupling (Synthesis of dihydropyrimidinone)
- (v) Transesterification reaction (Synthesis of biodiesel)
- (vii) Preparation of Iron (III) acetylacetonate

3. Spectrophotometric estimation/Identification: (One exercise) [15]

- (i) Aspirin, disprin, Sprintas
- (ii) Caffeine
- (iii) Ascorbic Acid (Lemon, Amla)
- (iv) Carbohydrate (Glucose, Sucrose, Fructose)
- (v) Amino acids

4. Qualitative Analysis: [25]

Separation, Purification and Identification of compounds of tertiary mixtures (three solids).

Record [15]

Viva [10]

M.Sc. (Physical Chemistry) Practical

M.M.100

Credit 4

A list of experiment under different headings are given below.

Typical experiments are to be selected from each type

1. Thermodynamics: [20]

Determination of the temperature dependence of the solubility of a compound in two solvents having similar intermolecular interaction (benzoic acid in water & in DMSO water mixture) and calculate the partial molar heat of solution

2. Spectroscopy: [20]

- (i) Determination of stoichiometry and Stability constant of inorganic (e.g. ferric-salicylic acid) and organic (e.g. amine iodine) complexes.
- (ii) Characterization of the complexes by electronic and IR Spectral Data.

3. Polarography:

[20]

- (i) Estimation of Pb^{2+} and $\text{Cd}^{2+}/\text{Zn}^{2+}$ and Ni^{2+} ions in a mixture of Pb^{2+} and $\text{Cd}^{2+}/\text{Zn}^{2+}$ and Ni^{2+} by Polarography.
- (ii) Determination of dissolved oxygen in aqueous solution of organic solvents.

4. Electronics :

[15]

- (iii) To study the characteristics of light emitting diode.
- (iv) To study the characteristics of Zener diode.
- (v) To study the characteristics of FET
- (vi) To plot the characteristics curve of a diode.
- (vii) Setting up of a thermostat: Constant temperature both

Record [15]

Viva [10]

The block contains several handwritten signatures and initials in blue ink. From left to right, there is a signature that looks like 'P', a signature that looks like 'Shah', a small circular stamp or initials, a signature that looks like 'Sah', and a signature that looks like 'Sah' with 'm' below it.

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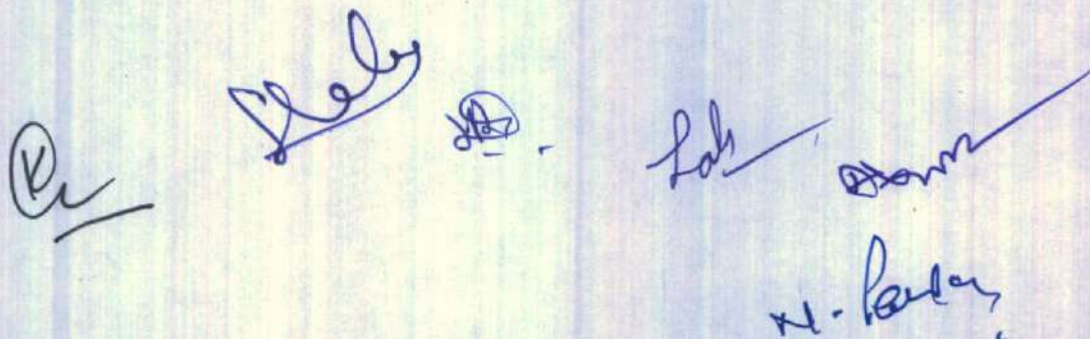
RESEARCH PROJECT

M.M.100

Credits-08

The research project is based on the following topics –

1. Coordination Chemistry
2. Macro Cyclic Chemistry
3. Green Chemistry
4. Nano Chemistry
5. Pesticide Chemistry
6. Polymer Chemistry
7. Polymer Nano Composite
8. Environmental Science
 - i. Air Pollution
 - ii. Soil Pollution
 - iii. Water Pollution
9. Natural Products
10. Synthetic Organic Chemistry
11. Drug Chemistry
12. Industrial Chemist

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Programme Outcomes

Ensures the students to understand, acquire knowledge in Quantum Chemistry, Group Theory Symmetry, Photochemistry, Advanced Concepts in Spectroscopy, Polymer Science, Green Chemistry, Solid State, Natural Products, disconnection approach as well as role of Modern Synthetic Reagents in Organic Transformations, Nanotechnology, Thermodynamics, Advanced Chemical Kinetics, Surface Analytical Techniques to measure Surface Properties of materials and the Advanced Principles of various Electrochemical Techniques and all branches of Chemistry. This syllabus also ensures the students to understand acquire knowledge and have hands on experience in multistep Inorganic/ Organic Compound Synthesis and Analysis by using Spectroscopic Techniques and have hands on experience in multistep Organic Synthesis and Analysis by using Spectroscopic Techniques.

The block contains several handwritten signatures and initials in blue ink. On the left, there is a signature that appears to be 'R'. In the center, there is a signature that looks like 'Shah' with a horizontal line underneath. To the right of that is a small circular stamp or mark. Further right, there is a signature that looks like 'Loh' followed by another signature that is less legible. Below these, on the right side, is the word 'Shah' written in a cursive style.