



**UNIVERSITY OF LUCKNOW
LUCKNOW
M.Sc. Chemistry Semester IV (Core)
Bioinorganic and Supramolecular Chemistry Syllabus
Paper I CH 401 (Inorganic Chemistry Elective)**

Unit I

Metal Storage Transport and Biomineralization

Ferritin, transferring and siderophores.

Calcium in Biology

Calcium in living cells, transport and regulation, molecular aspects of intramolecular processes, extracellular binding proteins.

Unit II

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 III

Metal – Nucleic Acid Interactions

Metal ions and metal complex interactions, Metal complexes . nucleic acids.

Metals in Medicine

Metal deficiency and disease, toxic effects of metals, metals used for diagnosis and chemotherapy with particular reference to anticancer drugs.

Unit IV

Supramolecular Chemistry

Concepts and language.

- (A) Molecular recognition: Molecular receptors for different types of molecules including arisonic substrates, design and synthesis of coreceptor molecules and multiple recognition.
- (B) Supramolecular reactivity and catalysis.
- (C) Transport processes and carrier design.
- (D) Supramolecular devices. Supramolecular photochemistry, supramolecular electronic, ionic and switching devices.

Some example of self-assembly in supramolecular chemistry.



**UNIVERSITY OF LUCKNOW
LUCKNOW
M.Sc. Chemistry Semester IV (Core)
Organotransition Metal Chemistry Syllabus
Paper II CH 402 (Inorganic Chemistry Elective)**

Unit I

Compounds of Transition Metal-Carbon Multiple bonds

Alkylidenes, alkylidynes, low valent carbenes and carbenes . synthesis, nature of bonds, structural characteristics, nucleophilic and electrophilic reactions on the ligands.

Transition Metal Compounds with Bonds to Hydrogen

Covalent hydrides : synthesis and important reactions.

Unit II

Transition metal δ -Complexes with unsaturated organic molecules

Alkenes, alkynes, allyl, dienes, dienyl and arene complexes . preparations, properties, nature of bonding and structural features. Important reactions related to nucleophilic and electrophilic attack on ligands.

Unit III

Transition Metal Compounds with Bonds to Carbon in Catalysis:

General idea of important catalytic steps: ligand coordination and dissociation, insertion and elimination, nucleophilic attack on coordinated ligands, oxidative addition and reductive elimination reactions.

Hydrogenation of alkenes using Wilkinson's catalyst, Hydroformylation of alkenes using Co and Rh catalysts, Carbonylation of methanol to acetic acid (Monsanto process), Oxidation of alkenes (Wacker process)

Unit IV

Fluxional Organometallic Compounds

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

Organometallic Compounds of Lanthanides and Actinides

Methods of preparation, properties and structural features.



**UNIVERSITY OF LUCKNOW
LUCKNOW
M.Sc. Chemistry Semester IV (Core)
Medicinal Chemistry Syllabus
Paper IV CH 404 (Organic Chemistry Elective)**

Unit I

Drug Design

Development of new drugs, procedures followed in drug design, concept of lead Compound and lead modification, concepts of prodrugs and soft drugs, structure-activity relationship (SAR) factors affecting bioactivity, resonance, inductive effect, isosterism, bio-isosterism, spatial, consideration. Theories of drugs activity; occupancy theory, rate theory, induced fit theory. Quantitative structure activity relationship. History and development of QSAR. Concepts of drugs receptors. Elementary treatment of drug receptors. Elementary treatment of drug receptor interactions. Physico-chemical parameters; lipophilicity, partition coefficient, electronic ionization constants, steric, Shelton surface activity parameter and redox potentials. Free-Wilson analysis, relationship between free-Wilson and Hansch analysis. LD-50, ED-50 (Mathematical derivations of equations excluded).

Pharmacokinetics

Introduction to drug absorption, disposition, elimination using pharmacokinetics important pharmacokinetic 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, members active drugs, drug metabolism xenobiotics, biotransformation significance of drug medicinal chemistry.

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 mechlorethamine, cyclophosphamide, melphalan, uracil, mustards, and 6mercaptapurine. Recent development in cancer chemotherapy. Hormone and natural products.

Unit III

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, oxyprenolol



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M.Sc. Chemistry Semester IV (Core)
Medicinal Chemistry Syllabus
Paper IV CH 404 (Organic Chemistry Elective)**

Local Antiinfective Drugs

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

Unit IV

Psychoactive Drugs-The Chemotherapy of mind

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

Antibiotics

Cell wall biosynthesis, inhibitors, -lactonem rings, antibiotics inhibiting protein synthesis. Synthesis of penicillin G, ampicillin, amoxicillin, chloramphenicol, cephalosporin, tetracycline and streptomycin.



UNIVERSITY OF LUCKNOW
LUCKNOW
M.Sc. Chemistry Semester IV (Core)
Organic Synthesis Syllabus
Paper III CH 403 (Organic Chemistry Elective)

Unit I

Oxidation

Introduction. Different oxidative processes. Hydrocarbons-alkenes, aromatic rings, saturated C-H groups (activated and unactivated). Alcohols, diols, aldehydes, ketones, ketals and carboxylic acids. Amines, hydrazines, and sulphides. Oxidations with ruthenium tetroxide, iodobenzene diacetate and thallium (III) nitrate.

Protecting Groups

Principle of protection of alcohol, amine, carbonyl and carboxyl group

Unit II

Reduction

Introduction. Different reductive processes. Hydrocarbons alkanes, alkenes, alkynes and aromatic rings. Carbonyl compounds-aldehydes, ketones, acids and their derivatives. Epoxides. Nitro, nitroso, azo and oxime groups.

Two Group C-C Disconnections

Diels-Alder reaction, 1,3-difunctionalized compounds, α,β -unsaturated carbonyl compounds, control in carbonyl condensations, 1,5-difunctionalized compounds. Micheal addition and Robinson annelation.

Unit III

Rearrangements

General mechanistic considerations . nature of migration, migratory aptitude, memory effects. A detailed study of the following rearrangements-Pinacol-pinacolone, Wagner-Meerwein, Demjanov, Benzil-Benzilic acid, Favorskii, Arndt-Eistert synthesis, Neber, Beckmann, Hofman, Curtius, Schimdt, Baeyer-Villigr, Shapiro reaction.

Unit IV

Ring Synthesis

Saturated heterocycles, synthesis of 3-, 4-, 5-and 6-membered rings, aromatic heterocycles in organic synthesis.

Synthesis of Some Complex molecules

Application of the above in the synthesis of following compounds: Camphor, Longifoline, Cortisone, Reserpine, Vitamin D, Juvabione, Aphidicolin and Fredericamysin A.



**UNIVERSITY OF LUCKNOW
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M.Sc. Chemistry Semester IV (Core)
Electrochemistry Syllabus
Paper V CH 406 (Physical Chemistry Elective)**

Unit I

Electrokinetic Phenomenon

Electrokinetic Effects, Electrokinetic potential/Zeta potentials, Determination of zeta potential, influence of ions on electrokinetic phenomena, Electro-Osmosis, Streaming potential, Sedimentation potential. Theoretical and quantitative treatment of electrokinetic phenomena, Electrokinetic Mobility and Bound hydrogen ion.

Unit II

Bioelectrochemistry

Threshold phenomena, Donnan Membrane Equilibrium, Membrane Potential, Application of Donnan Membrane Equilibrium, Hodgkin-Huxley Equation, Core conductor model. Quantum Aspects of Charge transfer at electrode-solution interfaces, quantization of charge transfer tunneling. Semiconductor Interfaces: Theory of double layer semiconductor solution interfaces, Limiting current in semiconductor electrode.

Unit III

Polarography and Voltametry

Electrode polarization, Theories of overvoltage, Importance of overvoltage, Principle of polarography, variations of the conventional polarographic methods, Pulse Polarography, Oscillographic polarography, Tensammetry, AC polarography, square wave polarography, Anodic stripping and cyclic voltametry, Qualitative and quantitative application of polarography, Determination of stoichiometry and formation constants of complexes. Amperometric titrations and advantages.

Unit IV

Solid State Electrochemistry

Solid Fuel Cells and Solid state batteries, General principles of semiconductivity and semiconductors, Temperature dependence of electrical resistances, Coherent Length, Piezoelectric effect, Piezoelectric and pyroelectric materials, Conducting polymers, Fullerenes-Doped conductors. Brief idea of Electrochemistry of molten electrolytes and nonaqueous solvents.



**UNIVERSITY OF LUCKNOW
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M.Sc. Chemistry Semester IV (Core)
Polymer Syllabus
Paper V CH 405 (Physical Chemistry Elective)**

Unit I

Basics and Polymer Characterization

Importance of polymers. Basic concepts: Monomers repeat units, degree of polymerization. Linear, branched and network polymers. Classification of polymers. Step Growth Polymerization: Theory of reactivity of large monomeric molecules, ring formation vs. chain formation.

Polymerization: Chain Reaction, Free radical, Cationic, Anionic and living polymers. Coordination and co-polymerization. Polymerization conditions and polymer reactions.

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. Light scattering, osmotic, ultracentrifugation viscosity and end group analysis methods.

Unit II

Testing, Structure and Properties

Analysis and testing of polymers; chemical analysis, IR and NMR of polymers. X-ray diffraction study. Microscopy. Thermal analysis and physical testing hardness, tensile strength. Fatigue, impact, Tear resistance and abrasion resistance.

Morphology and order in crystalline polymer-configurations of polymer chains. Crystal structures of polymers. Morphology of crystalline polymers, strain-induced morphology.

Unit III

Thermodynamic and Processing of Elastomers and Fibres

Crystallization and melting. Melting point T_m , 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 . Polymer structure and property relationship. General ideas about elastomers, plastics and fibres. Compounding and vulcanization of elastomers. Fibre spinning.

Unit IV

Plastic Technology, Some Commercial and Speciality Polymers

Processing techniques: Calendering, die casting, rotational casting, film casting, injection moulding, blow moulding, extrusion moulding, thermoforming, foaming and reinforcing.

Polyethylene, polyvinyl chloride, polyamides, polyesters, phenolic resins, epoxy resins silicone and PTFE polymers. Speciality polymers: Fire retarding polymers and electrically conducting polymers. Biomedical polymers . contact lens, dental, artificial heart, kidney, skin and blood cells . polymers.