#### DEVI AHILYA VISHWAVIDYALAYA, INDORE

Scheme of Marks
M. Sc. Chemistry
(w.e.f. 2018 and onwards)

#### SEMESTER - IV

Paper	Compulsory/Optional	Paper Title	Code	Max. Marks
			(MCH)	2
I	Compulsory	APPLICATION OF	511	85+ 15(CCE) = 100
		SPECTROSCOPY-II		2
II	Compulsory	SOLID STATE CHEMISTRY	512	85+ 15(CCE) = 100
III	Compulsory	BIOCHEMISTRY	513	85+ 15(CCE) = 100
IV	Optional	ANY TWO	514-518	85+ 15(CCE) = 100
V	Optional			85+ 15(CCE) = 100
	* ;	PRACTICAL- 1. Inorganic		33
		2. Organic		33
		3. Physical		34
	8			=100
***************************************		Project Work - Duration	60	100
	9		HOURS	
		Total		700

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#### DEVI AHILYA VISHWAVIDYALAYA, INDORE M.Sc. CHEMISTRY (SEMESTER –IV)

Paper No.

: I (Code-MCH-511)

Compulsory / Optional

: Compulsory

Max. Marks

: 100

#### PAPER I: APPLICATION OF SPECTROSCOPY-II

Unit-1	Ultraviolet and Visible spectroscopy Various electronic transitions (185-800 nm) Beer-Lambert law, Effect of solvent on electronic transitions, ultraviolet bands for carbonyl compounds, unsaturated carbonyl compounds, dienes, conjugated polyenes, Fieser Woodward rules for conjugated dienes and carbonyl compounds, ultraviolet spectra of aromatic compounds. Steric effect in biphenyls.
Unit-2	Infrared Spectroscopy Characteristic vibrational frequencies of alkanes, alkenes, alkynes, aromatic compounds, alcohols, ethers, phenols and amines. Detailed study of vibrational frequencies of carbonyl compounds (ketones, aldehydes, esters, amides, acids, anhydrides, lactones, lactams and conjugated carbonyl compounds). Effect of hydrogen bonding and solvent effect on vibrational frequencies, overtones, combination bands and fermi resonance.
Unit - 3	Nuclear Magnetic Resonance of Paramagnetic Substances in Solution The contact and Pseudo contact shifts, factors affecting nuclear relaxation, some applications including biochemical systems, an overview of NMR of metal nuclide with emphasis on <sup>195</sup> Pt and <sup>119</sup> Sn NMR.
Unit-4	Carbon-13 NMR Spectroscopy General considerations, chemical shift (aliphatic olefinic, alkyne, aromatic, heteroaromatic and carboynl carbon), coupling constants. Two dimension NMR spectroscopy-COSY, NOESY, DEPT, HMBC and HMQC techniques.
Unit-5	Mass Spectrometry Introduction ion production E1, C1 FD, ESI and FAB, factors affecting fragmentation, ion analysis, ion abundance Mass spectral fragmentation of organic compounds, common functional groups, molecular ion peak, metastable peak. Me Lafferty rearrangement. Nitrogen rule. High resolution mass spectrometry. Structure elucidation of simple molecules using UV – Visible, IR, NMR and mass spectral techniques.

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#### Books Suggested:

- 1. Physical Methods for Chemistry, R.S. Drago, Saunders Compnay.
- 2. Structural Methods in Inorganic Chemistry, E.A.V. Ebsworth, D.W.H. Rankin and S. Cradock, ELBS.
- 3. Infrared and Raman Spectral: Inorganic and Coordination Compounds K. Nakamoto, Wiley.
- 4. Progress in Inorganic Chemistry vol., 8, ed., F.A. Cotton, vol., 15 ed. S.J. Lippard, Wiley.
- 5. Transition Metal Chemistry ed. R.L. Carlin vol. 3 dekker.
- 6. Inorganic Electronic Spectroscopy, A.P.B. Lever, Elsevier.
- 7. NMR, NQR, EPR and Mossbauer Spectroscopy in Inorganic Chemistry, .V. Parish, Ellis Haywood.
- 8. Practical NMR Spectroscopy, M.L. Martin. J.J. Deepish and G.J. Martin, Heyden.
- 9. Spectrometric Identification of Organic Compounds, R.M. Silverstein, G.C. Bassler adn T.C. Morrill, John Wiley.
- 10. Introduction to NMR spectroscopy, R.J. Abraham, J. Fisher and P. Loftus, Wiley.
- 11. Application of Spectroscopy of Organic Compounds, J.R. Dyer Prentice Hall.
- 12. Spectroscopic Methods in Organic Chemistry D.H. Williams, I. Fleming, Tata McGraw-Hill.
- 13. Structural Methods in Inorganic Chemistry, E.A.V. Ebsworth, D.W.H. Rankin and S. Cradock, ELBS.

14. Introduction to NMR spectroscopy, R.J. Abraham, J. Fisher and P. Loftus, Wiley.

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# DEVI AHILYA VISHWAVIDYALAYA, INDORE M.Sc. CHEMISTRY (SEMESTER –IV)

Paper No. Compulsory / Optional Max. Marks : II (Code-MCH-512)

: Compulsory

: 100

#### PAPER II: SOLID STATE CHEMISTRY

Unit-1	Solid State Reactions
Omt-1	Sond State Reactions
	General principles, experimental procedure, co-precipitation as a precursory to solid state
	reactions, kinetics of solid state reactions.
Unit-2	Crystal Defects and Non-Stoichiometry
	Perfect and imperfect crystals, intrinsic and extrinsic defects-point defects, line and plane
	defects, vacancies-Schottky detects and Frenkel defects. Thermodynamics of Schottky and
	Frenkel defect formation, colour centres, non-stoichiometry and defects.
Unit-3	Electronic Properties and Band Theory
	Metals insulators and semiconductors, electronic structure of solidsband theory band
	structure of metals, insulators and semiconductors, Intrinsic and extrinsic semiconductors,
	doping semiconductors, p-n junctions, super conductors. Optical properties-Application of
	optical and electron microscopy. Magnetic Properties-Classification of materials: Effect
	of temperature calculation of magnetic moment, mechanism of ferro and anti ferromagnetic ordering super exchange.
Unit-4	Organic Solids
	Electrically conducting solids. organic charge transfer complex, organic metals, new
	superconductors.
Unit-5	Liquid Crystals:
	Types of liquid crystals: Nematic, Smectic, Ferroelectric, Antiferroelectric, Various
	theories of LC, Liquid crystal display, New materials.

#### Books Suggested:

1. Solid state chemistry and its applications, A.R. West. Peenum.

2. Principles of the Solid State, H.V. Keer, Wiley Eastern.

3. Solid State Chemistry, N.B. Hannay.

4. Solid State Chemistry, D.K. Chakrabarty, New Wiley Eastern.

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## DEVI AHILYA VISHWAVIDYALAYA, INDORE M.Sc. CHEMISTRY (SEMESTER –IV)

Paper No. Compulsory / Optional Max. Marks : III (Code-MCH-512)

: Compulsory

: 100

#### PAPER III: BIOCHEMISTRY

Unit-1	Metal Ions in Biological Systems Bulk and trace metals with special reference to Na, K, Mg, Ca, Fe, Cu, Zn, Co, and
	K+/Na+ pump.
	Bioenergetics and ATP Cycle.
	DNA polymerisation, glucose storage, metal complexes in transmission of energy;
	chlorophyll's, photosystem I and photosystem II in cleavage of water.
	Transport and Storage of Dioxygen
	Heam proteins and oxygen uptake structure and function of haemoglobin's, mygolobin,
	haemocyanms and hemerythrin, model synthetic complexes of iron, cobalt and copper.
Unit-2	Electron Transfer in Biology
	Structure and function of metal of proteins in electron transport processes cytochrome's and ion-sulphure proteins, synthetic models.
	Nitrogen fixation
k.	Biological nitrogen fixation, and its mechanism, nitrogenase, Chemical nitrogen fixation.
Unit-3	Enzymes
	Introduction and historical perspective, chemical and biological catalysis, remarkable
	properties of enzymes like catalytic power, specificity and regulation. Nomenclature and
	classification, extraction and purification. Fischer's lock and key and Koshalnd's induced
	fit hypothesis, concept and identification of active site by the use of inhibitors, affinity
	labeling and enzyme modification by site-directed mutagenesis. Enzyme kinetics,
	Michael's-Menten and Lineweaver Burk plots, reversible and irreversible inhibition.
	Mechanism of Enzyme Action
	Transition-state theory, orientation and Steric effect, acid-base catalysis, covalent
	catalysis, strain or distortion. Examples of some typical enzyme mechanisms for
	chemotrypsin, ribonuclease, lysozyme and carboxypeptidase.
	Kinds of Reactions Catalysed by Enzymes
	Nucleophilic displacement on a phosphorus atom, multiple displacement reactions and the
	coupling of ATP cleavage to endergonic processes. Transfer of sulphate, addition and
	elimination reactions, enolic intermediates in Isomerisations reactions, b-Cleavage and
	condensation, some isomerization and rearrangement reactions. Enzyme catalyzed
	carboxylation and decarboxylation.
Unit-4	Co-Enzyme Chemistry
	Cofactors as derived from vitamines, coenzymes, prosthetic groups, apoenzymes.
	Structure and biological functions of coenzyme A, thiamine pyrophosphate, pyridoxal
	phosphate, NAD+, NADP+, FMN, FAD, lipoic acid, vitamin B12. Mechanisms of
	reactions catalyzed by the above cofactors. Enzyme Models
	Host-guest chemistry, chiral recognition and catalysis, molecular recognition, molecular
	asymmetry and prochirality Biometric chemistry, crown ether, cryptates. Cyclodextrins,
	cyclodextrion-based enzyme models, clixarenes, ionospheres, micelles synthetic enzymes
,	or synzymes.
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#### Biotechnological Applications of Enzymes

large-scale production and purification of enzymes, techniques and methods of immobilization of enzymes, effect of immobilization on enzyme activity, application of immobilized enzymes, use of enzymes in food and drink industry-brewing and cheesemaking, syrups from cron starch, enzymes as targets for drug design. Clinical uses of enzymes, enzyme therapy, enzymes and recombinant DNA Technology.

#### Unit-5 Biological Cell and its Constituents

Biological cell, structure and functions of proteins, enzymes, DNA and RNA in living systems. Helix coils transition.

#### Bioenergetics

Standard free energy change in biochemical reactions, exergonic, endergonic. Hydrolysis of ATP, synthesis of ATP from ADP.

#### **Biopolymer Interactions**

Forces involved in biopolymer interactions. Electrostatic charges and molecular expansion, hydrophobic forces, dispersion force interactions. Multiple equilibrium and various types of bidning processes in biological systems. Hydrogen ion titration curves.

#### Cell Membrane and Transport of Ions

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

#### Books Suggested:

- 1. Principles of Bioinorganic Chemistry, S.J. Lippard and J.M. Berg, University Science Books.
- 2. Bioinorganic Chemistry, 1. Bertini, H.B. Gray, S.J. Lippard and J.S. Valentine, University Science Books.
- 3. Inorganic biochemistry vol. I and II ed. G.L. Eichhorn, Elsever.
- 4. Progress in Inorganic Chemistry, Vol 18 and 38 ed J.J. Lippard, Wiley.
- 5. Bioorganic Chemistry: A chemical Approach to Enzyme Action, Hermann Dugas and C. Penny, Springer Verlag.
- 6. Understanding Enzymes, Trevor Palmer, Prentice Hall.
- 7. Enzyme Chemistry: Impact and applications, Ed. Collin J suckling, chemistry.
- 8. Enzyme Mechanisms Ed. M.I. Page and A Williams, Royal Society of Chemistry.
- 9. Fundamentals of Enzymology, N.C. Price and L. Stevens. Oxford University Press.
- 10. Immobilized Enzymes: An Introduction and Applications in Biotechnology, Michael ID. Trevan, Hohn Wiley.
- 11. Enzymatic Reaction Mechanisms. C. Walsh. W.H. Freeman.
- 12. Enzyme Structure and Mechanism, A Fersht, W.H. Freeman
- 13. Biochemistry: The Chemical Reactions of Living Cells, D.E. Metzler, Academic Press.

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#### OPTIONAL PAPERS

#### Out of the following select any two papers:

OPT-1 MCH-514 Organic Synt	ithesis
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OPT-2 MCH-515 Chemistry of Natural Products

OPT-3 MCH-516 Analytical Chemistry

OPT-4 MCH-517 Electrochemistry

OPT-5 MCH-518 Medicinal Chemistry

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#### DEVI AHILYA VISHWAVIDYALAYA, INDORE

M.Sc. CHEMISTRY (SEMESTER -IV)

Paper No.

: OPT-1 Code- MCH-514

Compulsory / Optional

: Optional

Max. Marks

: 100

Optional Paper: Organic Synthesis

Unit-1	Disconnection Approach An introduction to synthons and synthetic equivalents. Disconnection approach, functional
	group inter-conversions, the importance of the order of events in organic synthesis, one
	group C-X and two group C-X disconnections, chemoselectivity, reversal of polarity, cyclisation reaction, amine synthesis. Protection of groups, chemo, region and stereo
	selectivity.
Unit-2	One Group C-C Disconnections
	Alcohols and carbonyl compounds, regioselectivity, alkene synthesis, use of acetylenes and aliphatic Nitro compounds in organic synthesis.
	Two Group C-C Disconnections
	Diels-Alder Reaction, 1,3-difunctionalised compounds, a-b- unsaturated carbonyl
	compounds, control in carbonyl condensations, 1,5-difunctionalised compounds. Micheal addition and Robinson annelation.
Unit-3	Oxidation
	Introduction, Different oxidative processes. Hydrocarbons-alkenes, aromatic rings,
	saturated C-H groups (activated and unactivated) Alcohols, diols, aldehyde's, ketones, ketals and carboxylic acids. Amines, hydrazines, and sulphides. Oxidations with
	ruthenium tetraoxide, iodobenzene diacetate and thallium. (III) Nitrate.
	Reduction
	Introduction, Different reductive processes. Alkanes, alkenes, alkynes, and aromatic rings. Carbonyl compounds-aldehydes, ketones, acids and their derivatives. Epoxides. Nitro,
	nitroso, azo and oxime groups. Expoxide, Nitro, Nitroso, azo and oxime groups. Hydrogenolysis.
Unit-4	Organometallic Reagents
	Principle, preparations, properties and applications of the following in organic synthesis
	with mechanistic details. Group I and II metal organic compounds Li, Mg, Hg, Cd, Zn and
	Ce Compounds.
Unit-5	Synthesis of some complex molecules:
	Application of the above in the synthesis of following compounds:
	Canphor, longifoline, cartisone, reserpine, vitamin D, juvabion, aphidicolin and fredericamycin. A

#### Books Suggested:

- 1. Designing Organic Synthesis, S. Warren. Wiley.
- 2. Organic Synthesis-Concept, Methods and Starting Materials, J. Fuhrhop.
- 3. Some Modern Methods of Organic Synthesis. W. carruthers, Cambridge Univ. Press.
- 4. Modern Synthetic Reactions H.O. House, W.A Benjamin.
- 5. Advanced Organic Chemistry: Reactions, Mechanisms and Structure, J. March. Wiley.

6. Principles, of Organic Chemistry Part B. F.a. Carey and R.J. Sundberg, Plenum Press.

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#### DEVI AHILYA VISHWAVIDYALAYA, INDORE M.Sc. CHEMISTRY (SEMESTER –IV)

Paper No. Compulsory / Optional Max. Marks : OPT-2 Code- MCH-515

: Optional

: 100

#### Optional Paper: Chemistry of Natural Products

Unit-1	Terpenoids and Carotenoids Calcifications, nomenclature, occurrence, isolation, general methods of structure determination, isoprene rule. Structure determination, stereochemistry, biosynthesis and synthesis of the following representative molecules: Citral, Geraniol α-Terpeneol, Menthol, Farnesol, Zingiberene, Santonin, Phytol, Abietic acid and β-Carotene.
Unit-2	Alkaloids Definition, nomenclature and physiological action, occurrence, isolation, general methods of structure elucidation, degradation, classification based on nitrogen heterocyclic ring, role of alkaloids in plants. Structure, stereochemistry, synthesis and biosynthesis of the following: Ephedrine, (+)- Coniine, Nicotine, Atropine, Quinine and Morphine.
Unit-3	Steroids Occurrence, nomenclature, basic skeleton, Diel's hydrocarbon and stereochemistry, Isolation, Structure determination and synthesis of Cholesterol, Bile acids, Androsterone, Testosterone, Estrone, Progesterone, Aldosterone, Biosynthesis of Steroids.
Unit-4	Plant Pigments Occurrence, nomenclature and general methods of structure determination. Isolation and synthesis of Apigenin, Luteolin Quercetin, Myrcetin, Quercetin 3-glucoside, Vitexin, Diadzein, Aureusin, Cyanidin-7arabinoside, Cyanidin, Hirsutidin, Biosynthesis of flavonoids: Acetate pathway and Shikimic acid pathway.  Prophyrins Structure and synthesis of Haemoglobin and Chlorophyll.
Unit-5	Prostaglandin Occurrence, nomenclature, classification, biogenesis and physiological effects. Synthesis of PGE2 and PGF2a.  Pyrethroids and Rotenones Synthesis and reactions of Pyrethroids and Rotenones. (For structure elucidation, emphasis is to be placed on the use of spectral parameters wherever possible).

#### Books Suggested:

- 1. Natural Products: Chemistry and Biological Significance, J. Mann, R.S. Davidson, J.B. Hobbs, D.V. Banthrope adn J.B. Harbome, Longman, Esses.
- 2. Organic Chemistry: Vol. 2 IL. Finar, ELBS
- 3. Stereoselective Synthesis: A Practical Approach, M. Norgradi, VCH.
- 4. Rodd's Chemistry of Carbon Compounds, Ed. S. Coffey, Elsevier.
- 5. Chemistry, Biological and Pharmacological Properties of Medicinal Plants from the Americas, Ed. Kurt Hostettmann, M.P. Gupta and A. Marston. harwood Academic Publishers.
- 6. Introduction to Flavonoids, B.A. Bohm. Harwood Academic Publishers.
- 7. New Trends in Natural Product chemistry, Ataaur Rahman and M.L. Choudhary, Harwood Academic Publishers.

8. Insecticides of Natural Origin, Sukh Dev, Harwood Academic Publishers.

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### DEVI AHILYA VISHWAVIDYALAYA, INDORE M.Sc. CHEMISTRY (SEMESTER –IV)

Paper No. Compulsory / Optional Max. Marks : OPT-3 Code- MCH-516

: Optional

: 100

Optional Paper: Analytical Chemistry

Unit-1	Introduction
	Role of analytical chemistry Classification of analytical methods classical an
	instrumental. Types of instrumental analysis. Selecting an analytical method. Neatness an
	cleanliness. laboratory operations and practices. Analytical balance. Techniques
	weighing, errors. Volumetric glassware cleaning and calibration of glassware. Sample
	Volumetric glassware cleaning and Calibration of glassware. Sample preparation
	dissolution and decompositions. Gravimetric techniques. Selecting and handling
	reagents. Laboratory notebooks. Safety in the analytical laboratory.
	Errors and Evaluation Definition of terms in mean and median. Precision-standar
	deviation, relative standard deviation. Accuracy-absolute error, relative error. Types
	error in experimental data determinate (systematic), indeterminate (or random) and gros
	Sources of error and the effects upon the analytical results. Methods for reporting
	analytical data. Statistical evaluation of data-indeterminate errors. The uses of statistics.
Unit-2	Food analysis
	Moisture, ash, crude protein, fat crude fiber, 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 foods
	products. Extraction and purification of sample. HPLC. Gas chromatography for
	organophosphates. Thin-layer chromatography for identification of chlorinated pesticide
7 2	in food products.
Unit-3	Analysis of Water Pollution
	Origin of Waste water, types, water pollutants and their effects. Sources of wat pollution-domestic, industrial, agricultural soil and radioactive wastes as sources
	pollution. Objectives of analysis-parameter for analysis-colour, turbidity, total solid
	conductivity, acidity, alakalinity, hardness, chloride, sulphate, fluoride, silica, phosphate
	adn different forms of nitrogen, Heavy metal pollution-public health significance
	cadmium, chromium, copper lead, zinc, managanese, mercurry and arsenic. Gener
	survey of instrumental technique for the analysis of heavy metals in aqueous system
	Measurements of DO, BOD, and COD. Pesticides as water pollutants and analysis. Wat
	pollution laws and standards.
Unit-4	Analysis of soil, Fuel, Body Fluids and Drugs
	(a) Analysis of Soil, moisture pH total nitrogen, phosphorus, silica, lime, magnesi
	manganese, sulphur and alkali salts.
	Fuel analysis: liquid and gas. Ultimate and proximate analysis-heating values-grading
	coal. Liquid fuels-flash point, aniline point, octane number and carbon residue. Gaseo
	fuels-produced gas and water gas-calorific value.
Unit-5	(a) Clinical Chemistry: Composition of blood-collection and preservation of sample
	Clinical analysis. Serum electrolytes, blood glucose, blood urea nitrogen, uric aci
	albumin, globulins, barbiturates, acid and alkaline phosphates. Immunoassay : principl
	of radio immunoassay (RIA) and applications. The blood gas analysis trace elements n the
	body
	(b) Drug analysis: Narcotics and dangerous drug. Classification of drugs. Screening by
	gas and thin-layer chromatography and spectrophotometeric measurements.

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#### Books Suggested:

- 1. Analytical Chemistry, G.D. Christian, J.Wicy.
- 2. Fundamentals o analytical Chemistry. D.A. Skoog. D.M. West and F.J. Hooler, W.B. Saunders.
- 3. Analytical Chemistry-Principles. J.H. Kennedy. W.B. Saunders.
- 4. Analytical Chemistry-Principles and Techniques. LG. Hargis. Prentice Hall.
- 5. Principles of Instrumental analysis D.A. Skoog and J.L. Loary, W.B. Saunders.
- 6. Principles of Instrumental Analysis D.A. Skoog W.B. Saunders.
- 7. Quantitative Analysis, R.A. Day, Jr. and A.L. Underwood, Prentice Hall.
- 8. Environmental Solution, S.M. Khopkar, Wiley Eastern.
- 9. Basic Concepts of Analysis Chemistry, S.M. Khopkar, Wiley Eastern.
- 10. Handbook of Instrumental Techniques for Analytical Chemistry, F. Settle, Prentice Hall

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#### DEVI AHILYA VISHWAVIDYALAYA, INDORE

M.Sc. CHEMISTRY (SEMESTER -IV)

Paper No.

: OPT-4 Code- MCH-517

Compulsory / Optional

: Optional

Max. Marks

: 100

#### Optional Paper: Electrochemistry

Unit-1	1. Conversion and Storage of Electrochemical Energy Present status of energy
· · · · · ·	consumption: Pollution problem. History of fuel cells, Direct energy conversion by
	electrochemical means. Maximum intrinsic efficiency of an electrochemical converter.
	Physical interpretation of the Carnot efficiency factor in electrochemical energy
	converters. Power outputs.
	electrochemical Generators (Fuel Cells): Hydrogen oxygen cells, Hydrogen Air cell,
	Hydrocarbon air cell, Alkane fuel cell, Phosphoric and fuel cell, direct NaOH fuel cells,
	applications of fuel cells.
	Electrochemical Energy Storage:
	Properties of Electrochemical energy storage: Measure of battery performance, Charging
	and discharging of a battery, Storage Density, Energy Density. Classical Batteries : (i
	Lead Acid (ii) Nickel-Cadmium, (iii) Zinc manganese dioxide. Modern Batteries : (i)
	Zinc-Air (ii) Nickel-Metal Hydride, (iii) Lithium Battery, Future Electricity storers
	Storage in (i) Hydrogen, (ii) Alkali Metals, (iii) Non aqueous solutions.
Unit-2	Corrosion and Stability of Metals :
	Civilization and Surface mechanism of the corrosion of the metals; Thermodynamics and
	the stability of metals, Potential -pH (or Pourbaix) Diaphragmsl; uses and abuses
	Corrosion current and corrosion potential -Evans diagrams. Measurement of corrosion rate
	: (i0 Weight Loss method, (ii) Electrochemical Method.
	Inhibiting Corrosion:
	Cathodic and Anodic Protection. (i) Inhibition by addition of substrates to the electrolyte
	environment, (ii) by charging the corroding method from external source, anodic
	Protection, Organic inhibitors, The fuller Story Green inhibitors.
	Passivation:
	Structure of Passivation films, Mechanism of Passivation, Spontaneous Passivation
	Nature's method for stabilizing surfaces.
Unit-3	Bioelectrochemistry
	bioelectrodics, Membrane Potentials, Simplistic theory, Modern theory, Electrical
	conductance in biological organism: Electronic, Protonic electrochemical mechanism of
	nervous systems, enzymes as electrodes.
	Kinetic of Electrode Process:
	Essentials of Electrode reaction. Current Density, Overpotential, Tafel Equation, Butler
	Volmer equation. Standard rate constant (K0) and Transfer coefficient (a), Exchange
	Current.
	Irreversible Electrode processes: Criteria of irreversibility, informatino from
	irreversible wave.
Jnit-4	Methods of determining kinetic parameters for quasi-rversible and irreversible
	waves : Koutecky's methods, Meits Israel Method, Gellings method
	Electrocatalysis
	Chemical catalysts and Electrochemical catalysts with special reference to purostates.
	porphyrin oxides of rare earths. Electrocatalysis in simple redox reactions, in reactions
	involving adsorbed species. Influence of various parameters
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#### Unit-5

#### Potential Sweep Method:

Linear sweep Voltammetry, Cyclic Voltammetry, theory and applications. Diagnostic criteria of cycli voltammetry. Controlled current microelectrode techniques : comparison with controlled potentials methods, chronopotentiometry, theory ad applications.

#### Bulk Electrolysis Methods:

Controlled potential coulometry, Controlled Coulometry, Electroorganic synthesis and its important applications. Stripping analysis: anodic and Cathodic modes, Pre electrolysis and Stripping steps, applications of Stripping Analysis.

#### **Books Suggested:**

- 1. Modern Electrochemistry Vol. I, IIa, Vol. IIB J'OM Bockris and A.K.N. Reddy, Plenum Publication, New York.
- 2. Polarographic Techniques by L. Meites, Interscience.
- 3. "Fuel Cells: Thjeir electrochemistry". McGraw Hill Book Company, New York.
- 4. Modern Polarographic Methods by A.M. Bond, Marcell Dekker.
- 5. Polarography and allied techniques by K. Zutshi, New age International publicatin. New Delhi.
- 6. "Electroaalytical Chemistry by Basil H. Vessor & Galen W.; Wiley Interscience.
- 7. Electroanalytical Chemistry by Basil H. Vessor & alen w.; Wiley Interscience.
- 8. Topics in pure and Applied Chemistry, Ed. S. K. Rangrajan, SAEST Publication, Karaikudi (India)

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#### DEVI AHILYA VISHWAVIDYALAYA, INDORE M.Sc. CHEMISTRY (SEMESTER –IV)

Paper No.
Compulsory / Ontion

Compulsory / Optional

Max. Marks

: OPT-5 Code- MCH-518

: Optional

: 100

#### Optional Paper: Medicinal Chemistry

Unit-1	Structure and activity: Relationship between chemical structure and biological activity	
	(SAR). Receptor Site Theory. Approaches to drug design. Introduction to combinatorial	
	synthesis in drug discovery. Factors affecting bioactivity. QSAR-Free-Wilson analysis,	
	Hansch analysis, relationship between Free-Wilson analysis and Hansch analysis.	
Unit-2	Pharmacodynamics:	
	Introduction, elementary treatment of enzymes stimulation, enzyme inhibition,	
	sulfonamides, membrane active drugs, drug metabolism, xenobiotics, biotransformation,	
	significance of drug metabolism in medicinal chemistry.	
Unit-3	Antibiotics and antibacterials	
	Introduction, Antibiotic β-Lactam type - Penicillins, Cephalosporins, Antitubercular -	
	Streptomycin, Broad spectrum antibiotics - Tetracyclines, Anticancer - Dactinomycin	
	(Actinomycin D)	
Unit-4	Antifungal –	
2	polyenes, Antibacterial - Ciprofloxacin, Norfloxacin, Antiviral - Acyclovir	
	Antimalarials: Chemotherapy of malaria. SAR. Chloroquine, Chloroguanide and	
	Mefloquine	
Unit-5	Non-steroidal Anti-inflammatory Drugs:	
	Diclofenac Sodium, Ibuprofen and Netopam	
	Antihistaminic and antiasthmatic agents:	
	Terfenadine, Cinnarizine, Salbutamol and Beclomethasone dipropionate.	

#### Books recommended

- 1. Introduction to medicinal chemistry, A. Gringuage, Wiley-VCH.
- 2. Wilson and Gisvold's Text Book of Organic Medicinal and Pharmaceutical Chemistry, Ed Robert F Dorge.
- 3. An Introduction to Drug Design, S.S. Pandeya and J.R. Dimmock, New Age Internaitonal.
- 4. Burger's Medicianl Chemistry and Drug Discovery, Vol-I (Chapter 9 and Chapter 14), Ed. M.E.Wolff, John Wiley.
- 5. Goodman and Gilman's Pharmacoloical Basis of Therapeutics, Mc GRaw-Hill.
- 6. The Organic Chemistry of Drug Design and Drug Action, R.B. Silverman, Academic Press.
- 7. Strategies for Organic Drug synthesis and Design, D.Lednicer, John Wiley.

8. Principles of Medicinal Chemistry W.O.Foye

9. Medicinal Chemistry; The Role of organic chemist in Drug Research, S.M. Roberts and B.J. Pricer.

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# DEVI AHILYA VISHWAVIDYALAYA, INDORE M. Sc. CHEMISTRY PRACTICALS (SEMESTER – IV)

Practical examination shall be conducted separately for each branch: (Duration: 6-8 hrs in each branch).

# Inorganic Chemistry Preparation / Ion – Exchange Chromatography 12 Spectrophotometric / Flame Photometric Determinations 12 Record 04 Viva Voce 05 Total: 33

#### Preparation:

- 1. Synthesis of metal acetylacetonate
- 2. Metal complex of DMSO
- 3. Determination of Cr (III) complex
- 4. [Co(NH<sub>3</sub>)<sub>5</sub>Cl]Cl<sub>2</sub>
- 5. Trans  $[Co(NH_3)_5(NO_2)_2]Cl$
- 6. Synthesis of metal ethylene diamine complex.

#### Ion Exchange Chromatography

- (a) Capacity of cation / anion exchange resin.
- (b) Separation of cobalt & nickel on anion exchange resin & their estimation volumetrically.

## Spectrophotometric Determinations / Spectroscopic identification of recorded spectra like IR, NMR, ESR & Mass

- a. Manganese / Chromium in steel sample
- b. Nickel by extractive spectrophotometric method
- c. Flouride / Nitrite / Phosphate

#### Flame Photometric Determinations

- A. Sodium & Potassium when present together.
- B. Lithium / Calcium / Barium / Strontium.

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#### Organic Chemistry

Synthesis of Organic compounds	10
Spectrophotometric Estimations or Isolation	10
Identification of Organic compounds (Spectral data)	04
Record	04
Viva Voce	<u>05</u>
Total:	33

#### Organic Synthesis (may involve multi – steps):

- 1. Friedel Crafts reaction.
- 2. Beckmann's reaction.
- 3. Synthesis of symmetrical tribromobenzene from aniline.
- 4. Enzymatic reduction of ethylacetoacetate using Baker's yeast to yield enantiomeric excess of ethyl-3-hydroxybutanoate & determine its optical density.
- 5. Biosynthesis of ethanol from sucrose.
- 6. Preparation of soap from fat with isolation of glycerol.

#### Spectroscopic Estimations:

- (1) Amino acids
- (2) Proteins
- (3) Carbohydrates
- (4) Aspirin
- (5) Caffeine

#### **Isolations:**

- 1. Casein from milk
- 2. Lycopine from tomato
- 3. Piperine from black pepper
- 4. Caffeine from tea leaves
- 5. Lactose from Milk
- 6. Preparation of Rose water using steam distillation

Identification of Organic compounds by the analysis of their spectral data (UV, IR, & MS).

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#### Physical Chemistry

Any one Experiment / Exercise from Section – A	*	p	12.
Any one Experiment / Exercise from Section - B			13
Record			04
Viva Voce			05
	Total:		34

#### Section - A

#### Spectroscopy

- 1. Determination of pKa of an indicator (e.g., methyl red) in (a) aqueous & (b) micellar media.
- 2. Determination of stoichiometry & stability constant of Ferric isothiocyanate ion complex in solution.
- 3. Determination of rate constant of alkaline bleaching of Malachite green & effect of ionic strength on the rate of reaction.

#### Polarography / Electronics

- 1. Identification & estimation of metal ions such as Cd<sup>2+</sup>, Pb<sup>2+</sup>, Zn<sup>2+</sup> & Ni<sup>2+</sup> etc. Polarographically.
- 2. Study of a metal ligand complex polarographically (using Lingane's method).
- 3. Determination of the V I characteristics of a given diode in :
- (a) Forward based mode / function.
- (b) Reverse based mode / function.

#### Section - B

#### **Chemical Kinetics**

- 1. Determination of rate constant & formation of an intermediate complex in the reaction of Ce (IV) & Hypophosphorous acid at ambient temperature.
- 2. Determination of energy & enthalpy of activation in the reaction of KMnO<sub>4</sub> & benzyl alcohol in acid medium.
- 3. Determination of energy of activation & entropy of activation from a single kinetic run.
- 4. Kinetics of an enzyme catalyzed reaction.

#### Thermodynamics

- 1. Determination of partial molar volume of solute (e.g., KCl) & solvent in a binary mixture.
- 2. Determination of the temperature dependence of the solubility of a compound in two solvents having similar intramolecular interactions (benzoic acid in water & in DMSO water mixture & calculate the partial molar heat of solution.

#### **Books Suggested**

- 1. Inorganic Experimens, J. Derek Woolings, VCH.
- 2. Microscale Inorganic Chemistry, Z. Szafran, R.M, Pike and M.M. Singh, Wiley.
- 3. Practical Inorganic Chemistry, G. Marr and B. W. Rockett, Van Nostrad.
- 4. The systematic Identification of Organic Compounds, R.L. Shriner and D.Y. Curlin.

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