

FOURTH SEMESTER

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| 1. Course Code : | 7. Maximum marks : 700 |
| 2. Course Name : M.Sc. Chemistry | 8. Minimum Passing percentage : 36 |
| 3. Total Paper : 5 | 9. Project work : 50 |
| 4. Compulsory Paper : 3 | 10. Project Passing Marks : 18 |
| 5. Optional Paper : 2 | 11. Practical : 2 |
| 6. Project : Y | 12. Practical Passing Marks : 18 Marks each |

Sub. code	Subject Name	Theory									Practical		Total	
		Paper					CCE		Total Marks		Max.	Min.	Max.	Min.
		1 st	2 nd	3 rd	Max.	Min.	Max.	Min.	Max.	Min.				
Compulsory paper														
	Application of Spectroscopy-II	85	0	0	85	131	15	5	180	36	0	0	180	36
	Solid State Chemistry	85	0	0	85	131	15	5	180	36	0	0	180	36
	Biochemistry	85	0	0	85	131	15	5	180	36	0	0	180	36
Optional paper (select any two)														
	Organic Synthesis	85	0	0	85	131	15	5	180	36	0	0	180	36
	Chemistry of Natural Products													
	Analytical Chemistry	85	0	0	85	131	15	5	180	36	0	0	180	36
	Electrochemistry	85	0	0	85	131	15	5	180	36	0	0	180	36
	Medicinal Chemistry	85	0	0	85	131	15	5	180	36	0	0	180	36
	Pesticites & Glass Industries	85	0	0	85	131	15	5	180	36	0	0	180	36
	Practical (i) inorganic chemistry	0	0	0	0	0	0	0	0	0	33	12	33	12
	Practical (ii) Organic chemistry	0	0	0	0	0	0	0	0	0	33	12	33	12
	Practical (iii) Physical chemistry	0	0	0	0	0	0	0	0	0	34	12	34	12
	Project work	0	0	0	0	0	0	0	50	18	0	0	50	18

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उच्च शिक्षा विभाग, म.प्र. शासन
 स्नातकोत्तर कक्षाओं के लिये सेमेस्टर अनुसार पाठ्यक्रम
 केंद्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म. प्र. के राज्यपाल द्वारा अनुमोदित

~~Session (MCH) 2010-2011~~
Session (MCH) 2010-2011

Class / कक्षा	: M.Sc.
Semester / सेमेस्टर	: IV
Subject / विषय	: Chemistry
Title of Subject Group	: APPLICATION OF SPECTROSCOPY-II
विषय समूह का शीर्षक	:
Paper No. / प्रश्नपत्र क्रमांक	: I (Code- MCH-511)
Compulsory / अनिवार्य या Optional / वैकल्पिक अनिवार्य	: Compulsory
Max. Marks अधिकतम अंक	: 35

Particulars/विवरण

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 ^{195}Pt and ^{119}Sn NMR.
Unit-4	Carbon-13 NMR Spectroscopy General considerations, chemical shift (aliphatic olefinic, alkyne, aromatic, heteroaromatic and carbonyl 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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Suggested Readings:

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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~~Session (I) 2010-2011~~

Class / कक्षा	: M.Sc.
Semester / सेमेस्टर	: IV
Subject / विषय	: Chemistry
Title of Subject Group	: SOLID STATE CHEMISTRY
विषय समूह का शीर्षक	:
Paper No. / प्रश्नपत्र क्रमांक	: II (Code- MCH-512)
Compulsory / अनिवार्य या Optional / वैकल्पिक अनिवार्य	: Compulsory
Max. Marks अधिकतम अंक	: 65

Particulars / विवरण

Unit-1	Solid 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 defects 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 solids band 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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~~2019-2020~~

Class / कक्षा	: M.Sc.
Semester / सेमेस्टर	: IV
Subject / विषय	: Chemistry
Title of Subject Group	: BIOCHEMISTRY
विषय समूह का शीर्षक	:
Paper No. / प्रश्नपत्र क्रमांक	: III (Code- MCH-513)
Compulsory / अनिवार्य या Optional / वैकल्पिक अनिवार्य	: Compulsory
Max. Marks अधिकतम अंक	: 85

Particulars / विवरण

Unit-1	<p>Metal Ions in Biological Systems</p> <p>Bulk and trace metals with special reference to Na, K, Mg, Ca, Fe, Cu, Zn, Co, and K⁺/Na⁺ pump.</p> <p>Bioenergetics and ATP Cycle.</p> <p>DNA polymerisation, glucose storage, metal complexes in transmission of energy; chlorophyll's, photosystem I and photosystem II in cleavage of water.</p> <p>Transport and Storage of Dioxygen</p> <p>Haem proteins and oxygen uptake structure and function of haemoglobin's, myoglobin, haemocyanins and hemerythrin, model synthetic complexes of iron, cobalt and copper.</p>
Unit-2	<p>Electron Transfer in Biology</p> <p>Structure and function of metal of proteins in electron transport processes cytochrome's and iron-sulphur proteins, synthetic models.</p> <p>Nitrogen fixation</p> <p>Biological nitrogen fixation, and its mechanism, nitrogenase, Chemical nitrogen fixation.</p>
Unit-3	<p>Enzymes</p> <p>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 Koshland'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.</p> <p>Mechanism of Enzyme Action</p>

	<p>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.</p> <p>Kinds of Reactions Catalysed by Enzymes</p> <p>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.</p>
<p>Unit-4</p>	<p>Co-Enzyme Chemistry</p> <p>Cofactors as derived from vitamins, 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</p> <p>Host-guest chemistry, chiral recognition and catalysis, molecular recognition, molecular asymmetry and prochirality Biometric chemistry, crown ether, cryptates. Cyclodextrins, cyclodextrin-based enzyme models, clixarenes, ionospheres, micelles synthetic enzymes or synzymes.</p> <p>Biotechnological Applications of Enzymes</p> <p>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 cheese-making, syrups from corn starch, enzymes as targets for drug design. Clinical uses of enzymes, enzyme therapy, enzymes and recombinant DNA Technology.</p>
<p>Unit-5</p>	<p>Biological Cell and its Constituents</p> <p>Biological cell, structure and functions of proteins, enzymes, DNA and RNA in living systems. Helix coils transition.</p> <p>Bioenergetics</p> <p>Standard free energy change in biochemical reactions, exergonic, endergonic. Hydrolysis of ATP, synthesis of ATP from ADP.</p> <p>Biopolymer Interactions</p> <p>Forces involved in biopolymer interactions. Electrostatic charges and molecular expansion, hydrophobic forces, dispersion force interactions. Multiple equilibrium and various types of binding processes in biological systems. Hydrogen ion titration curves.</p>

Cell Membrane and Transport of Ions
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Structure and functions of cell membrane, ion transport through cell membrane, irreversible thermodynamic treatment of membrane transport. Nerve conduction.
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Book 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, Elsevier.
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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Class / कक्षा	: M.Sc.
Semester / सेमेस्टर	: IV
Subject / विषय	: Chemistry
Title of Subject Group	: Organic Synthesis
विषय समूह का शीर्षक	:
Paper No. / प्रश्नपत्र क्रमांक	: OPT-1 (Code- MCH-514)
Compulsory / अनिवार्य या Optional / वैकल्पिक अनिवार्य	: Optional
Max. Marks अधिकतम अंक	: 85

Particulars / विवरण

Unit-1	<p>Disconnection Approach</p> <p>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.</p>
Unit-2	<p>One Group C-C Disconnections</p> <p>Alcohols and carbonyl compounds, regioselectivity, alkene synthesis, use of acetylenes and aliphatic Nitro compounds in organic synthesis.</p> <p>Two Group C-C Disconnections</p> <p>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.</p>
Unit-3	<p>Oxidation</p> <p>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 tetroxide, iodobenzene diacetate and thallium. (III) Nitrate.</p> <p>Reduction</p> <p>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.</p>

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

SUGGESTED READINGS:

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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~~Session (2019-2020) 2020-2021~~

Class / कक्षा	: M.Sc.
Semester / सेमेस्टर	: IV
Subject / विषय	: Chemistry
Title of Subject Group	: Chemistry of Natural Products
विषय समूह का शीर्षक	:
Paper No. / प्रश्नपत्र क्रमांक	: OPT-2 (Code- MCH-515)
Compulsory / अनिवार्य या Optional / वैकल्पिक अनिवार्य	: Optional
Max. Marks अधिकतम अंक	: 85

Particulars / विवरण

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	<p>Prostaglandin</p> <p>Occurrence, nomenclature, classification, biogenesis and physiological effects. Synthesis of PGE₂ and PGF_{2a}.</p> <p>Pyrethroids and Rotenones</p> <p>Synthesis and reactions of Pyrethroids and Rotenones. (For structure elucidation, emphasis is to be placed on the use of spectral parameters wherever possible).</p>
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SUGGESTED READINGS:

1. Natural Products : Chemistry and Biological Significance, J. Mann, R.S. Davidson, J.B. Hobbs, D.V. Bantrophe adn J.B. Harbome, Longman, Esses.
2. Organic Chemistry : Vol. 2 1L. 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, Ataur Rahman and M.L. Choudhary, Harwood Academic Publishers.
8. Insecticides of Natural Origin, Sukh Dev, Harwood Academic Publishers.

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~~Session (2020-2021)~~

Class / कक्षा	: M.Sc.
Semester / सेमेस्टर	: IV
Subject / विषय	: Chemistry
Title of Subject Group	: Analytical Chemistry
विषय समूह का शीर्षक	:
Paper No. / प्रश्नपत्र क्रमांक	: OPT-3 (Code- MCH-516)
Compulsory / अनिवार्य या Optional / वैकल्पिक अनिवार्य	: Optional
Max. Marks अधिकतम अंक	: 85

Particulars / विवरण

Unit-1	<p>Introduction</p> <p>Role of analytical chemistry Classification of analytical methods classical and instrumental. Types of instrumental analysis. Selecting an analytical method. Neatness and cleanliness. laboratory operations and practices. Analytical balance. Techniques of 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 or reagents. Laboratory notebooks. Safety in the analytical laboratory.</p> <p>Errors and Evaluation Definition of terms in mean and median. Precision-standard deviation, relative standard deviation. Accuracy-absolute error, relative error. Types of error in experimental data determinate (systematic), indeterminate (or random) and gross. Sources of error and the effects upon the analytical results. Methods for reporting analytical data. Statistical evaluation of data-indeterminate errors. The uses of statistics.</p>
Unit-2	<p>Food analysis</p> <p>Moisture, ash, crude protein, fat crude fiber, carbohydrates, calcium, potassium, sodium and phosphate. Food adulteration-common adulterants in food, contamination of foods stuffs. Microscopic examination of foods for adulterants. Pesticide analysis in food products. Extraction and purification of sample. HPLC. Gas chromatography for organophosphates. Thin-layer chromatography for identification of chlorinated pesticides in food products.</p>

Unit-3	Analysis of Water Pollution Origin of Waste water, types, water pollutants and their effects. Sources of water pollution-domestic, industrial, agricultural soil and radioactive wastes as sources of pollution. Objectives of analysis-parameter for analysis-colour, turbidity, total solids, conductivity, acidity, alkalinity, hardness, chloride, sulphate, fluoride, silica, phosphates and different forms of nitrogen, Heavy metal pollution-public health significance of cadmium, chromium, copper, lead, zinc, manganese, mercury and arsenic. General survey of instrumental technique for the analysis of heavy metals in aqueous systems. Measurements of DO, BOD, and COD. Pesticides as water pollutants and analysis. Water 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, magnesia, manganese, sulphur and alkali salts. Fuel analysis : liquid and gas. Ultimate and proximate analysis-heating values-grading of coal. Liquid fuels-flash point, aniline point, octane number and carbon residue. Gaseous fuels-produced gas and water gas-calorific value.
Unit-5	(a) Clinical Chemistry : Composition of blood-collection and preservation of samples. Clinical analysis. Serum electrolytes, blood glucose, blood urea nitrogen, uric acid, albumin, globulins, barbiturates, acid and alkaline phosphates. Immunoassay : principles of radio immunoassay (RIA) and applications. The blood gas analysis trace elements in the body (b) Drug analysis : Narcotics and dangerous drug. Classification of drugs. Screening by gas and thin-layer chromatography and spectrophotometric measurements.

SUGGESTED READINGS:

1. Analytical Chemistry, G.D. Christian, J.Wicy.
2. Fundamentals of 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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केंद्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म. प्र. के राज्यपाल द्वारा अनुमोदित

~~Session (2019-2020)~~

Class / कक्षा	: M.Sc.
Semester / सेमेस्टर	: IV
Subject / विषय	: Chemistry
Title of Subject Group	: Electrochemistry
विषय समूह का शीर्षक	:
Paper No. / प्रश्नपत्र क्रमांक	: OPT-4 (Code- MCH-517)
Compulsory / अनिवार्य या Optional / वैकल्पिक अनिवार्य	: Optional
Max. Marks अधिकतम अंक	: 85

Particulars / विवरण

Unit-1	<p>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.</p> <p>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.</p> <p>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.</p>
Unit-2	<p>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) Diagrams; uses and abuses, Corrosion current and corrosion potential -Evans diagrams. Measurement of corrosion rate : (i) Weight Loss method, (ii) Electrochemical Method.</p> <p>Inhibiting Corrosion : Cathodic and Anodic Protection. (i) Inhibition by addition of substrates to the electrolyte environment, (ii) by changing the corroding method from external source, anodic Protection, Organic inhibitors, The fuller Story Green inhibitors.</p> <p>Passivation : Structure of Passivation films, Mechanism of Passivation, Spontaneous Passivation Nature's method for stabilizing surfaces.</p>

Unit-3	<p>Bioelectrochemistry :</p> <p>bioelectrodics, Membrane Potentials, Simplistic theory, Modern theory, Electrical conductance in biological organism: Electronic, Protonic electrochemical mechanism of nervous systems, enzymes as electrodes.</p> <p>Kinetic of Electrode Process:</p> <p>Essentials of Electrode reaction. Current Density, Overpotential, Tafel Equation, Butler Volmer equation. Standard rate constant (K_0) and Transfer coefficient (α), Exchange Current.</p> <p>Irreversible Electrode processes : Criteria of irreversibility, informatino from irreversible wave.</p>
Unit-4	<p>Methods of determining kinetic parameters for quasi-rversible and irreversible waves : Koutecky's methods, Meits Israel Method, Gellings method</p> <p>Electrocatalysis :</p> <p>Chemical catalysts and Electrochemical catalysts with special reference to purostates, porphyrin oxides of rare earths. Electrocatalysis in simple redox reactions, in reaction involving adsorbed species. Influence of various parameters.</p>
Unit-5	<p>Potential Sweep Method :</p> <p>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.</p> <p>Bulk Electrolysis Methods :</p> <p>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.</p>

SUGGESTED READINGS:

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. "Electroanalytical 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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Session (2019-2020)

Class / कक्षा	: M.Sc.
Semester / सेमेस्टर	: IV
Subject / विषय	: Chemistry
Title of Subject Group	: Medicinal Chemistry
विषय समूह का शीर्षक	:
Paper No. / प्रश्नपत्र क्रमांक	: OPT-5 (Code- MCH-518)
Compulsory / अनिवार्य या Optional / वैकल्पिक अनिवार्य	: Optional
Max. Marks अधिकतम अंक	: 85

Particulars / विवरण

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 - 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.

BARKATULLAH UNIVERSITY, BHOPAL

~~Session 9/2019-20~~

Class / कक्षा	: M.Sc.
Semester / सेमेस्टर	: IV
Subject / विषय	: Chemistry
Title of Subject Group	: Industrial Chemistry-
विषय समूह का शीर्षक	: Pesticites & Glass Industries
Paper No. / प्रश्नपत्र क्रमांक	: OPT-5A (Code- MCH-518 A)
Compulsory / अनिवार्य या Optional / वैकल्पिक अनिवार्य	: Optional
Max. Marks अधिकतम अंक	: 85

Particulars / विवरण

Unit- I Cleansing Agents

Cleansing Agents : Toilet and washing soaps; preparation and uses, Synthetic detergents; alkyl aryl sulfonates, fatty alcohol surfaces, ethanolamines, nonionic detergents.

Unit-II Fertilizers and Inorganic Materials :

Fertilizers : Fertilizers Industries in India, Manufacture of Ammonium salts. Urea, Nitrates, Phosphates and Superphosphates, Nitrogen fixation.

Glass: Types, their composition and properties testing glass. Manufacture of Glass Fibres. Optical Glass, Coloured Glasses, Lead Glass and Neutron Absorbing Glass.

Ceramics: Important clays and feldspar. Glazing and vitrification, Glass ceramics.

Unit-III Cement : Types and their manufacture, setting process.

Ferrous Industry: Manufacture of steel and other important alloys.

Silicon : Pre silicon, Electronics Industry.

Unit- IV Pesticies and Food additives

Pesticies and Food additives : Classification, important categories of insecticides, fungicides, herbicides and rodenticies; Mode of action.

Unit-V Chemistry and synthesis of common pesticides : Such and Tabun, Sarin, Daygon, DDYP paraquat.

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~~Session (2019-2020)~~

M.Sc. Semester IV Chemistry Practical

(Duration: 6-8 hrs in each branch)

Practical examination shall be conducted separately for each branch.

Inorganic Chemistry	Max Marks - 33
Preparation	12
Spectrophotometric Determinations	
Flame Photometric Determinations	12
Record	04
Viva Voice	05
Total	33

Preparation

Preparation of selected inorganic compounds and their study by IR, electronic spectra, and magnetic susceptibility measurements. Handling of air and moisture sensitive compounds involving vacuum lines. Selection can be made from the following :

1. Sodium amide. Inorg. Synth., 1946, 2, 128.
2. Atomic absorption analysis of Mg and Ca.
3. Synthesis of trichlorodiphenylantimony (V) hydrate. Inorg. Synth., 1985, 23, 194
4. Sodium tetrathionate $\text{Na}_2\text{S}_4\text{O}_6$.
5. Metal complex of dimethyl sulfoxide : $\text{CuCl}_2 \cdot 2\text{DMSO}$ J.Chem. Educ., 1982, 59, 57.
6. Synthesis of metal acetylacetonate : Inorg. Synth., 1957, 5, 130, 1963, 1, 183.
7. Cis and Trns $[\text{Co}(\text{en})_2\text{Cl}_2]^+$.
8. Determination of Cr (III) complex. $[\text{Cr}(\text{H}_2\text{O})_6]\text{NO}_3 \cdot 3\text{H}_2\text{O}$. Inorg. synth., 1972, 13, 184.
9. Preparation and use of Ferrocene. J. Chem. Edu. 1966, 43, 73; 1976, 53, 730.
10. Preparation of $[\text{Co}(\text{phenanthroline-5,6 quinone})]$.

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

- a. Manganese/Chromium in steel sample.
- b. Nickel by extractive spectrophotometric method.
- c. Fluoride/nitrite/phosphate.
- d. Copper-Ethylene diamine complex : Slope-ratio method.

Flame Photometric Determinations

- a. Sodium and potassium when present together.
- b. Lithium/calcium/barium/strontium.
- c. Cadmium and magnesium in tap water.

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~~Syllabus (M.P.) 2019-2020~~

Organic Chemistry	Max Marks - 33
Multi-step Synthesis of Organic Compounds	12
Spectroscopy/Spectrophotometric Determinations	12
Record	04
Viva Voice	05
Total	33

Multi-step Synthesis of Organic Compounds

The exercise should illustrate the use of organic reagents and may involve purification of the products by chromatographic techniques. Photochemical reaction Benzophenone \rightarrow Benzpinacol \rightarrow Benzpinacolone Beckmann rearrangement : Benzanilide from benzene Benzene \rightarrow Benzophenone \rightarrow Benzophenone oxime \rightarrow Benzanilide Benzilic acid rearrangement : Benzilic acid from benzoin Benzoin \rightarrow Benzil \rightarrow Benzilic acid Synthesis of heterocyclic compounds Skraup synthesis : Preparation of quinoline from aniline Fisher Indole synthesis : Preparation of 2-phenylindole from phenylhydrazine. Enzymatic synthesis Enzymatic synthesis Enzymatic reduction : reduction of ethyl acetoacetate using Baker's yeast to yield enantiomeric excess of S (+) ethyl-3-hydroxybutanoate and determine its optical purity. Biosynthesis of ethanol from sucrose. Synthesis using microwave Alkylation of diethyl malonate with benzyl chloride. Synthesis using phase transfer catalyst. Alkylation of diethyl malonate or ethyl acetoacetate with an alkylhalide.

Spectroscopy

Identification of organic compounds by the analysis of their spectral data (UV, IR, PMR, CMR & MS)

Spectrophotometric (UV/VIS) Estimations/isolation of the following (any one compound)

Spectroscopic estimation

1. Amino acids
2. Proteins
3. Carbohydrates
4. Ascorbic acid
5. Aspirin
6. Caffeine

Isolation

1. Casein from milk
2. Lycopine from tomato
3. Piperine from black pepper
4. Caffeine from tea leaves
5. Lactose from milk

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~~संशोधन (संशोधन) 2018-2019~~

Physical Chemistry	Max Marks - 34
Experiment No. 1	13
Experiment No. 2	12
Record	04
Viva Voice	05
Total	34

Spectroscopy

- Determination of PKa of an indicator (e.g. methyl red) in (a) aqueous and (b) micellar media.
- Determination of stoichiometry and stability constant of Ferricisothiocyanation complex ion in solution.
- Determination of rate constant of alkaline bleaching of Malachite green and effect of ionic strength on the rate of reaction.

Chemical Kinetics

- Determination of rate constant and formation constant of an intermediate complex in the reaction of Ce(IV) and Hypophosphorous acid at ambient temperature.
- Determination of energy and enthalpy of activation in the reaction of KMnO₄ and benzyl alcohol in acid medium.
- Determination of energy of activation of and entropy of activation from a single kinetic run.
- Kinetics of an enzyme catalyzed reaction.

Thermodynamics

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

Polarography

- i. Identification and estimation of metal ions such as Cd^{+2} , Pb^{+2} , Zn^{+2} , and i^{+2} etc. polarographically.
- ii. Study of a metal ligand complex polarographically (using Lingane's Method).

The students are expected to visit industries to gain practical knowledge, if possible.

Books Suggested

1. Inorganic Experiments, 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 Nostrand.

The systematic Identification of Organic Compounds, R.L. Shriner and D.Y. Curtin