

AS Per Recommended by Board of Studies Held on 02/09/2020

For session 2020-21

M.Sc. I Semester

Paper I

MCH-401: INORGANIC CHEMISTRY I

Unit - I

Stereochemistry and Bonding in Main Group Compounds:

VSEPR, Walsh diagram (triatomic and penta-atomic molecules), $d\pi - p\pi$ bond, Bent rule and energetic of hybridization, some simple reactions of covalently bonded molecules.

111

Metal-Ligand Equilibrium in Solution

Stepwise and overall formation constants and their interaction, trends in stepwise constant factors affecting the stability of metal complexes with reference to the nature of metal ion and ligand Chelate effect and its thermodynamic origin, determination of binary formation constants by potentiometry and spectrophotometry.

Unit 1 –

Reaction Mechanism of Transition Metal Complexes

Energy profile of a reaction, reactivity of metal complex, inert and labile complexes, kinetic application of valence bond and crystal field theories, kinetics of octahedral substitution, acid hydrolysis, factors affecting acid hydrolysis, base hydrolysis, conjugate base mechanism, direct and indirect evidences in favour of conjugate mechanism, anion reactions, reactions without metal ligand bond cleavage. Substitution reactions in square planar complexes, the trans effect, mechanism of the substitution reaction, Redox reaction, electron transfer reactions, mechanism of one electron transfer reactions, outer sphere type reactions, cross reactions and Marcus-Hush theory, inner sphere type reactions.

Unit - IV

Metal-Ligand bonding

Limitation of crystal field theory .Concept of ACFT/LFT. Molecular orbital theory theory for bonding in octahedral, tetrahedral and square planar complexes. π – bonding MOT

Unit - V

HSAB Theory : Classification of acids and bases as hard and soft; HSAB principle, theoretical basis of hardness and softness; Lewis acid base reactivity approximation; donor and acceptor numbers, R and C equation; applications of HSAB concept.

Harold
02-04-2022
Dr. Suman
Ran
~~Harold~~
02-04-2022

(29)

P.T.C.
SEMESTER I

Paper-I
MCH-401: INORGANIC CHEMISTRY I

m
m.m. 4246

Unit-I**Stereochemistry and Bonding in Main Group Compounds :**VSEPR, Walsh diagram (triaxialic and penta-atomic molecules), d_{g-p} bond, Bent rule and energetics of hybridization, some simple reactions of covalently bonded molecules.**Unit-II****Metal-Ligand Equilibrium in Solution**

Stepwise and overall formation constants and their interaction, trends in stepwise constant, factors affecting the stability of metal complexes with reference to the nature of metal ion and ligand. Chelate effect and its thermodynamic origin, determination of binary formation constants by potentiometry and spectrophotometry.

Unit-III**Reaction Mechanism of Transition Metal Complexes**

Energy profile of a reaction, reactivity of metal complex, inert and labile complexes, kinetic application of valence bond and crystal field theories, kinetics of octahedral substitution, acid hydrolysis, factors affecting acid hydrolysis, base hydrolysis, conjugate base mechanism, direct and indirect evidences in favour of conjugate mechanism, anion reactions, reactions without metal ligand bond cleavage. Substitution reactions in square planar complexes, the trans effect, mechanism of the substitution reaction. Redox reaction, electron transfer reactions, mechanism of one electron transfer reactions, outer sphere type reactions, cross reactions and Marcus-Hush theory, inner sphere type reactions.

Unit-IV**Metal-Ligand bonding . Concepts of CFT/LFT;**Limitation of crystal field theory, molecular orbital theory for bonding in octahedral, tetrahedral and square planar complexes, π -bonding and multicenter orbital theory MO-T.**Unit-V****HSAB Theory : Classification of acids and bases as hard and soft; HSAB principle, theoretical basis of hardness and softness; Lewis-acid base reactivity approximation, donor and acceptor numbers, E and C equation, applications of HSAB concept.****Books Suggested :**

1. Advanced Inorganic Chemistry, F.A. Cotton and Wilkinson, John Wiley.
2. Inorganic Chemistry, J.E. Huheey, Harper & Row.
3. Chemistry of the Elements, N.N. Greenwood and A. Earnshaw, Pergamon.
4. Inorganic Electronic Spectroscopy, A.R.P. Leach, Elsevier.
5. Magnetochemistry, R.J. Carlin, Springer Verlag.
6. Comprehensive Coordination Chemistry eds., G. Wilkinson, R.J.B. Green and J.A. Mc Cleverty, Pergamon.

30

M.Sc. Semester-I

M. M. ~~✓~~

Paper-II

MCH-402: ORGANIC CHEMISTRY I

M. M. ~~✓~~ 40

Unit-I

Theory of Bonding in Organic Molecules

Generalized chemical bonding-conjugation, cross conjugation, resonance, delocalization, bonding in fullerenes, tautomerism. Aromaticity in benzoid and non-benzoid compounds, alternate and non-alternate hydrocarbons. Hückel's rule, energy levels of π -molecular orbitals, annulenes, anti-aromaticity, homo-aromaticity, PMO analysis, Bonds weaker than covalent-addition compounds, crown ether complexes and cryptands, inclusion compounds, catenanes and rotaxanes.

Unit-II

Stereochemistry

Enantiomers due to unavoidable crowding. Elements of symmetry, chirality, molecules with more than one chiral center, threo and erythro isomers, methods of resolution, optical activity, enantiotopic and diastereotopic atoms, groups and faces, stereospecific and enantioselective synthesis. Asymmetric synthesis. Optical activity in the absence of chiral carbon (biphenyls, allenes and spirane chirality due to helical shape). Stereochemistry of compounds containing nitrogen, sulphur and phosphorus.

Approved
02/20

Unit III

Conformational analysis and linear free energy relationship, conformational analysis of cycloalkanes, decalin, effect of conformation on reactivity, conformation of sugars.

Stability, structure, stability and reactivity of carbocations, carbanions, free radicals, alkenes and nitrenes. The Hammett equation and linear free energy relationship, substituents and reaction constants, Taft equation.

Approved
02/20
Date
2-2-20
Signature
Chairman
2-2-20
Signature
Examiner
2-2-20
Signature
2-2-20
Signature
2-2-20
Signature
2-2-20
Signature
2-2-20

Unit-IV

Reaction Mechanism : Structure and Reactivity

Type of mechanisms, types of reactions, thermodynamic and kinetic requirements, kinetic and thermodynamic control, Hammond's postulate, Curtiss-Hammond principle, potential energy diagrams, transition states and intermediates, methods of determining reaction mechanisms, isotopes effects.

Unit-V

Approved
02/20

Diphasic Nucleophilic Substitution

One SN2, SN1 mixed S_N1 and S_N2 and SET mechanism. The neighboring group participation by σ and π bonds, anilimic assistance, mechanism, neighboring group participation by σ and π bonds, anilimic assistance.

Approved
02/20
Signature
2-2-20

Approved
02/20
Signature
2-2-20

Classical and nonclassical carbocations, phenonium ions, norboryl systems, common carbocation rearrangements. Application of NMR spectroscopy in the detection of carbocations. The S_N1 mechanism. Nucleophilic substitution at an allylic, aliphatic trigonal and a vinylic carbon. Reactivity effects of substrate structure, attacking nucleophile, leaving group and reaction medium, phase transfer catalysis and ultrasound, ambident nucleophile, regioselectivity.

Book Suggested

1. Advanced Organic Chemistry-Reactions, Mechanism and Structure, Jerry March, John Wiley.
2. Advanced Organic Chemistry, F.A. Carey and R.J. Sundberg, Plenum.
3. A Guide Book to Mechanism in Organic Chemistry, Peter Sykes, Longman.
4. Structure and Mechanism in Organic Chemistry, C.K. Ingold, Cornell University Press.
5. Organic Chemistry, R.T. Morrison and R.N. Boyd, Prentice-Hall.
6. Modern Organic Reactions, H.O. House, Benjamin.
7. Principles of Organic Synthesis, R.O.C. Norman and J.M. Coxon, Blackie Academic & Professional.
8. Reaction Mechanism in Organic Chemistry, S.M. Mukherji and S.P. Singh, Macmillan.
9. Pericyclic Reactions, S.M. Mukherji, Macmillan, India.
10. Stereochemistry of Organic Compounds, D. Nasipuri, New Age International.
- ~~Stereochemistry of Organic Compounds, P.S. Kalsi, New Age International.~~

~~Supriya Rai Kumar
Shashi~~

~~DR
Shashi~~

3 |

M. Sc. Semester-I

Paper-III

M.M. 65
M.M. 42 40

Unit-1

Unit-I

Introduction to Exact Quantum Mechanical Results

Schrödinger equation and the postulates of quantum mechanics. Discussion of solutions of the Schrödinger equation to some model systems viz., particle in a box, the harmonic oscillator, the rigid rotor, the hydrogen atom and helium atom.

Using It

Approximate Methods

The variation theorem, linear variation principle. Perturbation theory (First order and nondegenerate). Applications of variation method and perturbation theory to the Helium atom.

Molecular Orbital Theory

Hückel theory of conjugated systems bond and charge density calculations. Applications to ethylene, butadiene, cyclopropenyl radical cyclobutadiene etc. Introduction to extended Hückel theory.

~~lhr~~ ~~MB~~ ~~AF~~

~~Gjøvik~~ ~~Osby~~ ~~Stavanger~~ ~~Oslo~~ ~~Trondheim~~ ~~Oslo~~

~~Support~~ ~~Railway~~ ~~stamps~~ ~~2012/2013~~

~~AF~~ ~~02.9.10~~ ~~Division~~ ~~2012/2013~~

~~AF~~ ~~02.5.10~~ ~~Travel~~ ~~AF~~

~~AF~~ ~~2012/2013~~

UNIT III

Angular Momentum

Ordinary angular momentum, generalized angular momentum, eigenfunctions for angular momentum, eigenvalues of angular momentum operator using ladder operators addition of angular momenta, spin, antisymmetry and Pauli exclusion principle.

Unit-IV

Classical Thermodynamics

Brief resume of concepts of laws of thermodynamics, free energy, chemical potential and entropies. Partial molar free energy, partial molar volume and partial molar heat content and their significance. Determinations of these quantities. Concept of fugacity and determination of fugacity. Non-ideal systems : Excess function s for non-ideal solutions. Activity, activity coefficient, Debye-Hückel theory for activity coefficient of electrolytic solutions; determination of activity and activity coefficients; ionic strength. Application of phase rule to three component systems; second order phase transitions.

Unit-V

Statistical Thermodynamics

Concept of distribution, thermodynamic probability and most probable distribution. Ensemble averaging, postulates of ensemble averaging. Canonical, grand canonical and micro-canonical ensembles, corresponding distribution laws (using Lagrange's method of undetermined multipliers). Partition functions-translation, rotational, vibrational and electronic partition functions. Calculation of thermodynamic properties in terms of partition. Application of partition functions. Fermi-Dirac Statistics, distribution law and applications to metal. Bose-Einstein statistics distribution Law and application to helium.

Books Suggested

1. Physical Chemistry, P.W. Atkins, ELBS
2. Introduction to Quantum Chemistry, A.K. Chandra, Tata McGraw Hill.
3. Quantum Chemistry, Ira N. Levine, Prentice Hall.
4. Coulson's Valence, R. Mc Weeny, ELBS.
5. Chemical Kinetics, K.J. Laidler, McGraw-Hill.
6. Kinetics and Mechanism of Chemical Transformation J. Rajaraman and T. Sugunan, McGraw-Hill.
7. Micelles, Theoretical and Applied Aspects, V. M. Rao, Plenum.
8. Modern Electrochemistry Vol. I and Vol II J.O.M. Bockris and A.K.N. Reddy, Plenum.
9. Introduction to Polymer Science, V.R. Cowarikar, N.V. Vishwanathan and J. Sudher, Wiley Eastern.
10. Introduction to Quantum Chemistry-R.K. Prasad, New Age Publication.

02.09.2020
02.09.2020
02.09.2020

32

M.Sc. Semester-I

M.M. 

Paper-IV
MCH-404: Group Theory & Spectroscopy I M.M.WK 40

Unit-1

Symmetry and Group theory in Chemistry

Symmetry elements and symmetry operation, definition of group, subgroup. Conjugacy and classes. Point symmetry group. Schonflies symbols, representations of groups by matrices (representation for the C_n , C_{nv} , C_{nh} , D_{nh} group to be worked out fully). Character of a representation. The great orthogonality theorem (without proof) its importance. Character tables and their use; spectroscopy. Derivation of character for C_{2v} and $C_{\infty v}$ point group. Symmetry aspects of molecular vibrations of H_2O molecule.

100

Microwave Spectroscopy

Classification of molecules, rigid rotor model, effect of isotopic substitution on the rotation frequencies, intensities, non-rigid rotor, Stark effect, nuclear and electron spin interaction and effect of external field, applications.

Unit-III

Band-Spectroscopy

view of linear harmonic oscillator, vibrational energies of diatomic molecules, zero point energy, force constant and bond strengths; anharmonicity, Morse potential energy diagram, vibration-rotation spectroscopy, P.Q.R. branches, Breakdown of Oppenheimer approximation; vibrations of polyatomic molecules. Selection rules, normal modes of vibration, group frequencies, overtones, hot bands, factors affecting the band positions and intensities, far IR region, metal ligand vibrations, normal co-ordinate analysis.

— 1 —

IR Spectroscopy

Resonant and quantum theories of Raman effect, Pure rotational, vibrational and rotational-rotational Raman spectra, selection rules, mutual exclusion principle, Resonance Raman spectroscopy, coherent anti stokes Raman spectroscopy (CARS)

100

Electronic Spectroscopy

Molecular Spectroscopy
Energy levels, molecular orbitals, vibronic transitions, vibrational progressions and symmetry of the excited states, Franck-Condon principle, electronic spectra of polyatomic molecules. Emission spectra; radio-active and non-radioactive decay, internal conversion, spectra of transition metal complexes, charge-transfer spectra.

Infrared Spectroscopy

Principles; photo-electric effect, ionization process, Koopman's theorem

(33)

Photoelectron spectra of simple molecules, ESCA, chemical information from ESCA.
Auger electron spectroscopy-basic idea.

Books suggested

1. Modern Spectroscopy, J.M. Hollas, John Wiley.
2. Applied Electron Spectroscopy for chemical analysis d. H. Windawi and F.L. Ho, Wiley Interscience.
3. NMR, NQR, EPr and Mossbauer Spectroscopy in Inorganic Chemistry, R.V. Parish, Ellis Harwood.
4. Physical Methods in Chemistry, R.S. Drago, Saunders College.
5. Chemical Applications of Group Theory, F.A. Cotton.
6. Introduction to Molecular Spectroscopy, G.M. Barrow, Mc Graw Hill.
7. Basic Principles of Spectroscopy, R. Chang, Mc Graw Hill.
8. Theory and Application of UV Spectroscopy, H.H. Jaffe and M. Orchin, IBH-Oxford.
9. Introduction to Photoelectron Spectroscopy, P.K. Ghosh, John Wiley.
10. Introduction to Magnetic Resonance. A Carrington and A.D. MacLachalan, Harper & Row.

Apparatus
O2 20
Oxygen
20%
Ammonia
O2 20
Hydrogen
O2 20
Methane
Hydrogen
Suppliers
Gates and Crellins
OR
20%
20%

1

M.Sc. Schnabel - 1

Papier-Y

MCH-405 (a) : MATHEMATICS FOR CHEMISTS

MATHEMATICS FOR CHEMISTS (For students without Mathematics in B.Sc.)

M. M. ~~1953~~

M.M. 45

49

10

Vittorio

Vectors, dot, cross and triple products etc. gradient, divergence and curl, Vector Calculus.
Matrix Algebra

Matrix Algebra

Addition and multiplication; inverse, adjoint and transpose of matrices.

Unit-II

Differential Calculus Functions, etc.

Functions, continuity and differentiability, rules for differentiation, applications of differential calculus including maxima and minima (examples related to maximally populated rotational energy levels, Boltz's radius and most probable velocity from Maxwell's distribution etc.).

Unit-III

Integral calculus -

Basic rules for integration: integration by parts, partial fractions, substitution

Reduction formulae; applications of integral calculus

Functions of several variables, partial differentiation, co-ordinate transformations (e.g. Cartesian to spherical polar).

Bill Curr. Mrs. M. S. D. A. M. C. D. P. 20°
Dipper Spring 9.1
Surprise Ranch 10.1 10.1 10.1
Grand Canyon 10.1 10.1 10.1
Mesa 10.1 10.1 10.1
2/9/19 10.1 10.1 10.1
J.B. 10.1 10.1 10.1

(By)

Unit-IV

Unitary Differential equations

Order and first degree differential equations, homogenous, exact and linear equations. Applications to chemical kinetics, secular equilibria, quantum chemistry etc.

Second order differential equation and their solutions.

Unit-V

Statistical and Probability

Permutations and combinations, probability and probability theorems average, variance and mean square deviation examples from the kinetic theory of gases etc., fitting including least squares fit etc with a general polynomial fit.

Book Suggested

1. The Chemistry Mathematics Book, E. Steiner, Oxford University Press.
2. Mathematics for chemistry, Doggett and Suichific, Logman.
3. Mathematical for Physical chemistry : P. Daniels, Mc. Graw Hill.
4. Chemical Mathematics D.M. Hirst, Longman.
5. Applied Mathematics for Physical Chemistry, J.R. Barrie, Prentice Hall.
6. Basic Mathematics for Chemists, Tebbutt, Wiley.

First 20th
2. a 20th

last 20th

1st year

2nd year

3rd year

Supplementary

Rainbow

Final
2012

AB
2012

B.Sc. Semester - I

MCH-405 (b) BIOLOGY FOR CHEMISTS
(For students without Biology in B.Sc.)

M.M.
M.M. MHR 4 D

Unit-I

Structure and Functions . Structure prokaryotic and eukaryotic cells, intracellular organelles and their functions, comparison of plant and animal cells. Overview and their functions, comparison of plant and animal cells. Overview of metabolic processes-catabolism and anabolism. ATP - the biological energy currency. Origin of life-unique properties of carbon chemical evolution of living systems. Introduction to bio-molecules, building blocks of biomolecules.

Unit-II

Carbohydrates

Conformation of monosaccharides, structure and functions of important derivatives of mono-saccharides like glycosides, deoxy sugars, myoinositol, amino sugars. N-acetylneurameric acid, sialic acid disaccharides and polysaccharides. Structural polysaccharides cellulose and chitin. Storage polysaccharides-starch and glycogen. Structure and biological function of glucosaminoglycans of mucopolysaccharides. Carbohydrates of glycoproteins and glycolipids. Role of sugars in biological recognition. Blood group substances. Ascorbic acid.

Ch 1

Ch 2

Ch 3

Ch 4

Ch 5

Ch 6

Ch 7

Ch 8

Ch 9

Ch 10

Ch 11

Ch 12

Ch 13

Ch 14

Ch 15

Ch 16

Ch 17

Ch 18

Ch 19

Ch 20

Ch 21

Ch 22

Ch 23

Ch 24

Ch 25

Ch 26

Ch 27

Ch 28

Ch 29

Ch 30

Ch 31

Ch 32

Ch 33

Ch 34

Ch 35

Ch 36

Ch 37

Ch 38

Ch 39

Ch 40

Ch 41

Ch 42

Ch 43

Ch 44

Ch 45

Ch 46

Ch 47

Ch 48

Ch 49

Ch 50

Ch 51

Ch 52

Ch 53

Ch 54

Ch 55

Ch 56

Ch 57

Ch 58

Ch 59

Ch 60

Ch 61

Ch 62

Ch 63

Ch 64

Ch 65

Ch 66

Ch 67

Ch 68

Ch 69

Ch 70

Ch 71

Ch 72

Ch 73

Ch 74

Ch 75

Ch 76

Ch 77

Ch 78

Ch 79

Ch 80

Ch 81

Ch 82

Ch 83

Ch 84

Ch 85

Ch 86

Ch 87

Ch 88

Ch 89

Ch 90

Ch 91

Ch 92

Ch 93

Ch 94

Ch 95

Ch 96

Ch 97

Ch 98

Ch 99

Ch 100

Ch 101

Ch 102

Ch 103

Ch 104

Ch 105

Ch 106

Ch 107

Ch 108

Ch 109

Ch 110

Ch 111

Ch 112

Ch 113

Ch 114

Ch 115

Ch 116

Ch 117

Ch 118

Ch 119

Ch 120

Ch 121

Ch 122

Ch 123

Ch 124

Ch 125

Ch 126

Ch 127

Ch 128

Ch 129

Ch 130

Ch 131

Ch 132

Ch 133

Ch 134

Ch 135

Ch 136

Ch 137

Ch 138

Ch 139

Ch 140

Ch 141

Ch 142

Ch 143

Ch 144

Ch 145

Ch 146

Ch 147

Ch 148

Ch 149

Ch 150

Ch 151

Ch 152

Ch 153

Ch 154

Ch 155

Ch 156

Ch 157

Ch 158

Ch 159

Ch 160

Ch 161

Ch 162

Ch 163

Ch 164

Ch 165

Ch 166

Ch 167

Ch 168

Ch 169

Ch 170

Ch 171

Ch 172

Ch 173

Ch 174

Ch 175

Ch 176

Ch 177

Ch 178

Ch 179

Ch 180

Ch 181

Ch 182

Ch 183

Ch 184

Ch 185

Ch 186

Ch 187

Ch 188

Ch 189

Ch 190

Ch 191

Ch 192

Ch 193

Ch 194

Ch 195

Ch 196

Ch 197

Ch 198

Ch 199

Ch 200

Ch 201

Ch 202

Ch 203

Ch 204

Ch 205

Ch 206

Ch 207

Ch 208

Ch 209

Ch 210

Ch 211

Ch 212

Ch 213

Ch 214

Ch 215

Ch 216

Ch 217

Ch 218

Ch 219

Ch 220

Ch 221

Ch 222

Ch 223

Ch 224

Ch 225

Ch 226

Ch 227

Ch 228

Ch 229

Ch 230

Ch 231

Ch 232

Ch 233

Ch 234

Ch 235

Ch 236

Ch 237

Ch 238

Ch 239

Ch 240

Ch 241

Ch 242

Ch 243

Ch 244

Ch 245

Ch 246

Ch 247

Ch 248

Ch 249

Ch 250

Ch 251

Ch 252

Ch 253

Ch 254

Ch 255

35

Unit-III

Lip-Set

Fatty acids, essential fatty acids, structure and function of triacylglycerols, glycerophospholipids, sphingolipids, cholesterol, bile acids, prostaglandins. Lipoproteins-composition and function, role in atherosclerosis. Properties of lipid aggregates-micelles, bilayers, liposomes and their possible biological functions. Biological membranes. Fluid mosaic model of membrane structure. Lipid metabolism-b-oxidation of fatty acids.

Unit-IV

Amino-acids, Peptides and Proteins

Chemical and enzymatic hydrolysis of proteins to peptides, amino acid sequencing. Secondary structure of proteins, force responsible for holding of secondary structures, α -helix, β -sheets, super secondary structure, triple helix structure of collagen. Tertiary structure of protein-folding and domain structure. Quaternary structure. Amino acid metabolism-degradation and biosynthesis of amino acids, sequence determination: chemical/enzymatic/mass spectral, racemization/detection. Chemistry of oxytocin and tryptophan releasing hormone (TRH).

Wolke-3

Nucleic Acids

Purine and pyrimidine bases of nucleic acids, base pairing via H-bonding. Structure of ribonucleic acids (RNA) and deoxyribonucleic acid (DNA), double helix model of DNA and forces responsible for holding it. Chemical and enzymatic hydrolysis of nucleic acids. The chemical basis for heredity, an overview of replication of DNA, transcription, translation and genetic code. Chemical synthesis of mono and tri-nucleoside.

Book Suggested

1. Principles of Biochemistry, A.L. Lehninger, Worth Publishers.
 2. Biochemistry, L. Stryer, W.H. Freeman.
 3. Biochemistry, J. David Rawat, Neil Patterson.
 4. Biochemistry, Voet and Voet, John Wiley.
 5. Outlines of Biochemistry E.E. Coas and P.K. Stumpf, John Wiley.

PRACTICAL

(Duration: 6-8 hrs in each branch)

Practical examination shall be conducted separately for each branch.

Inorganic Chemistry
Quantitative and quantitative Analysis
Chromatography
Preparation
Record
Viva Voce :-

Jagdish Singh,
R.K. Singh,
Sugra Singh, Jaya Chaudhary
L.D.S. Yadav, I.R. Sridharan

M.Sc. I Sem.

PRACTICAL.

Duration: 6-8 hrs in each branch)

Pactical examination shall be conducted separately for each branch.

Organic Chemistry

Organic Synthesis

Qualitative Analysis

Record

Viva Voce

Chromatography Separation of cations and anions by

Column Chromatography : Ion exchange.

12

12

4

5

— Page No. I-53 to I-60.
Exp. No. 5.0 to 5.9,

Preparations

Preparation of selected inorganic compounds and their studies by L.R. electronic spectra, Raman, E.S.R. and magnetic susceptibility measurements. Handling of air and moisture sensitive compounds.

1. $[\text{Co}(\text{NH}_3)_6] \text{[Co}(\text{NO}_3)_6\text{]} - \text{Exp. No. 3.13, Page No. I-30,}$

2. $[\text{Cu}(\text{Crown}) (\text{NO}_3)_2]\text{Cl}_2\text{H}_2\text{O} - \text{Exp. No. 3.16, Page No. I-32}$

3. $[\text{Hg}(\text{CSCN})_4] - \text{Exp. No. 3.17 Page No. I-32}$

4. $[\text{Co}(\text{Py})_3\text{Cl}_3] - \text{Exp. No. 3.7, Page No. I-26}$

5. $[\text{Ni}(\text{NH}_3)_6]\text{Cl}_3 - \text{Exp. No. 3.8, Page No. I-26}$

6. $\text{NaMgI}_2 - \text{Exp. No. 3.1, Page No. I-26, Inorganic Preparations, Chapt. - 2 [3.1]}$

7. $[\text{Cu}(\text{NH}_3)_4]\text{SO}_4\text{H}_2\text{O} - \text{I-22, Inorganic Preparations, Chapt. - 2 [3.1]}$

Organic Chemistry

Organic Synthesis

Quantitative Analysis

Record

Viva Voce

12

12

4

5

Organic Synthesis

Aromatic Substitution: Dibenzal acetone from benzaldehyde. Sandmeyer reaction: p-chlorobromo from p-toluidine. Acetoacetic ester Condensation: Synthesis of ethyl-
butylacetate by A.E.E. condensation. Cannizzaro reaction: 4-Chlorobenzoaldehyde
+ nitroso. Friedel Crafts reaction: b-Benzylo propionic acid from succinic anhydride
and benzene. Aromatic electrophilic substitution: Synthesis of p-nitroaniline and p-
bromoaniline. The products may be Characterized by Spectral Techniques.

Quantitative Analysis

Determination of the percentage or number of hydroxyl groups in an organic compound, Exp. No. 6.1
by acetylation method/ estimation of amines/phenols using bromate bromide solution or — Exp. No. 6.2/6
Ketone method. Determination of iodine and Saponification values of an oil sample.

Determination of DO, COD and BOD of water sample.

Physical Chemistry

Page No. 0-182-185

Exp. No. 6.7, 6.8, 6.9

Supplementary
Questionnaire

Final

Ques. No. 6.10

Ans. No. 6.10

Ques. No. 6.10

Ans. No. 6.10

Electrochemistry
potentiometry/pHmetry
conductometry
viscosity

3
9
8
4
5

Electrochemistry

Determination of the velocity constant, order of the reaction and energy of activation for saponification of ethyl acetate by sodium hydroxide conductometrically.

Determination of solubility and solubility product of sparingly soluble salts (e.g. PbSO_4 , BaSO_4) conductometrically. $\frac{1}{6}$

Determination of the strength of strong and weak acid in a given mixture conductometrically.

To study of the effect of solvent on the conductance of AgNO_3 /acetic acid and to determine the degree of dissociation and equilibrium constant in different solvents and in their mixtures (DMSO, DMF, dioxane, acetone, water) and to test the validity of Debye-Hückel-Onsager theory.

Determination of the activity coefficient of zinc ions in the solution of 0.002 M zinc sulphate using Debye-Hückel's limiting law.

Potentiometry/pHmetry

1. Determination of strengths of halides in a mixture potentiometrically. $\frac{3+6}{2} \text{ P-9.1}$
2. Determination of the valency of mercurous ions potentiometrically. $\frac{3+6}{2} \text{ P-9.1} - \text{P-112, 7.11}$
3. Determination of the strength of strong and weak acids in a given mixture using a potentiometer/pH meter.
4. Determination of temperature dependence of EMF of a cell.
5. Determination of the formation constant of silver-ammonia complex and stoichiometry of the complex potentiometrically.
6. Acid-base titration in a non-aqueous media using a pH meter.
7. Determination of activity and activity coefficient of electrolytes P- 14.6, Exp. No. 7.11C
8. Determination of the dissociation constant of acetic acid in DMSO, DMF, acetone and dioxane by titrating it with KOH. Page No. - P- 14.7, Exp. No. 7.17
9. Determination of the dissociation constant of monobasic/dibasic acid by Albert-Salicylic method. Exp. No. - 7.17 Page No. 14.7 - P. 2
10. Determination of thermodynamic constants, DG , DS , and DI for the reaction by c.m.f. method. $\text{Zn} + \text{H}_2\text{SO}_4 \rightarrow \text{ZnSO}_4 + 2\text{H}_2$

Polarimetry

1. Determination of rate constant for hydrolysis/inversion of sugar using a polarimeter. $\frac{2+5}{2} \text{ P-13.1}$ Exp. No 51, Page No. - I-92
2. Enzymic kinetics-inversion of sucrose.

By Prof. B
Date 9
2020

2/11/20
Ritika
2/11/20

✓ Aliv
✓ Dr. T. D.
✓ Supriya
✓ Sunita
✓ Swapnil
✓ Swapnil

✓ 7.17
✓ 7.17
✓ 7.17

✓ Phool
✓ Phool
✓ Phool

✓ 92
✓ 92

Books Suggested

11. Vogel's Textbook of Quantitative Analysis, revised, J. Bassett, R.A. Denny, G.H. Jeffery and I. Mervinum, ELBS.
12. Synthesis and Characterization of Inorganic Compounds, W.L. Jolly, Prentice Hall.
13. Experiments and Techniques in Organic Chemistry, D.P. Pasto, T. Johnson and M. Miller, Prentice Hall.
14. Macroscale and Microscale Organic Experiments, K.L. Williamson, D.A. Heath.
15. Systematic Qualitative Organic Analysis, H. Middleton, Edward Arnold.
16. Handbook of Organic Analysis-qualitative and Quantitative, H. Clark, Edward Arnold.
17. Vogel's Textbook of Practical Organic Chemistry, A.R. Tatchell, John Wiley.
18. Practical Physical Chemistry, A.M. James and F.E. Prichard, Longman.
19. Lindley's Practical Physical chemistry, B.P. Levitt, Longman.
20. Experimental Physical Chemistry, R.C. Das and B. Behera, Tata McGraw Hill.

pi J
9/4/2016

(2/13/16)

ATM
02/09/16

Partha
Bisi
Supriya.
Rakhee
10/10/16

(Mon)
29/12/16

PR2
02/09/2016

TER II

Paper I

MCH-406 : INORGANIC CHEMISTRY II

Unit - I

Spectral Studies of Transition Metal Complexes :

Electronic ground states, correlation. Orgel and Tanabe-Sugano diagrams for transition metal ions (d^1 , d^6 , d^7 , d^8 , d^9 states), Selection rule for electronic spectroscopy, Intensity of various electronic transitions. Calculations of $10Dq$, B and β parameters, charge transfer spectra.

Unit - II

Properties of Transition Metal Complexes :

Anisotropic magnetic moments, Quenching of orbital contribution. Orbital contribution to magnetic moment, magnetic exchange coupling and spin crossover. TIP (Temp Independent paramagnetism)

Unit - III

Carbonyl Complexes :

Carbonyl structure and bonding, vibrational spectra of metal carbonyls for bonding and dissociation, important reaction of metal carbonyls; preparation, bonding structure and reaction of transition metal nitrosyl, dinitrogen and dioxygen complexes; tertiary phosphine as ligand; Metal olefin bonding.

Unit - IV

Duster :

Metallocarbaboranes, metallocarboranes and metallocarboranes compound with metal metal bonds.

Unit - V

Rotatory Dispersion and Circular Dichroism :

Optical activity and circularly polarized light; optical rotatory power and circular birefringence, ellipticity and circular dichroism; ORD and CD effect, Faraday and Kerr effects; Assignment of circular dichroism; ORD and cotton effect, Faraday and Kerr effects; Assignment of circular dichroism; ORD and CD for the determination of (i) absolute stereochemistry; applications of ORD and CD for the determination of (i) absolute stereochemistry; applications of ORD and CD for the determination of (ii) isomerism due to non-planarity of chelate rings.



SEMESTER II

M.M. H₂O

Paper-I
MCH-406: INORGANIC CHEMISTRY II

Unit-I

Electronic Spectral Studies of Transition Metal Complexes :

Spectroscopic ground states, correlation. Orgel and Tanabe-Sugano diagrams for transition metal complexes (d^1 - d^9 states). Selection rule for electronic spectroscopy. Intensity of various type electronic transitions. Calculations of $10Dq$, B and β parameters, charge transfer spectra.

Unit-II

Magnetic Properties of Transition Metal Complexes

Anomalous magnetic moments, Quenching of Orbital contribution. Orbital contribution to magnetic moment, magnetic exchange coupling and spin crossover; TIP (Zeeman, hyperfine parameters, DSC)

Unit-III

Metal π -Complexes

Metal carbonyl, structure and bonding, vibrational spectra of metal carbonyls for bonding and structural elucidation, important reactions of metal carbonyls; preparation, bonding structure and important reaction of transition metal nitrosyl, dinitrogen and dioxygen complexes; tertiary phosphine as ligand; metal-ligand bonding

Unit-IV

Metal Clusters

Higher boranes, carboranes, metallocarboranes and metallo-carboranes compounds with metal metal multiple bonds.

Unit-V

Optical Rotatory Dispersion and Circular Dichroism

Linearly and circularly polarized lights; optical rotatory power and circular birefringence, ellipticity and circular dichroism; ORD and Cotton effect, Faraday and Kerr effects; Assignment of electronic transitions; applications of ORD and CD for the determination of (i) absolute configuration of complexes and (ii) isomerism due to non-planarity of chelate rings.

Books Suggested :

7. Advanced Inorganic Chemistry, F.A. Cotton and Wilkinson, John Wiley.
8. Inorganic Chemistry, J.E. Huheey, Harpes & Row.
9. Chemistry of the Elements, N.N. Greenwood and A. Earnshaw, Pergamon.
10. Inorganic Electronic Spectroscopy, A.B.P. Lever, Elsevier.
11. Magnetochimistry, R.I. Carlin, Springer Verlag.
12. Comprehensive Coordination Chemistry eds., G. Wilkinson, R.D. Gillars and J.A. Mc Cleverty, Pergamon.

II
Paper-~~Version~~
MCH-407: ORGANIC CHEMISTRY II

109. R.

40

Unit 1

Aromatic Electrophilic Substitution

The arenium ion mechanism, orientation and reactivity, energy profile diagrams. The ortho/para ratio, ipso attack, orientation in other ring systems. Quantitative treatment of reactivity in substrates and electrophiles. Diazonium coupling, Vilsmeier reaction, Gatterman-Koch reaction.

Aromatic Nucleophilic Substitution

The SNAr, SN1, benzene and SN1 mechanism, Reactivity effect of substrate structure, leaving group and attacking nucleophile. The Von Richte, Sommelet-Hauser, and Smiles rearrangements.

Unit-III

Free Radical Reactions

types of free radical reactions, free radical substitution mechanism, mechanism at an aromatic substrate, neighbouring group assistance. Reactivity for aliphatic and aromatic substrates at a bridgehead. Reactivity in the attacking radicals. The effect of solvents on reactivity. Allylic halogenation (NBS), oxidation of aldehydes to carboxylic acids, auto-oxidation, coupling of alkynes and arylation of aromatic compounds by diazonium salts, Sandmeyer reaction. Free radical rearrangement. Hunsdiecker reaction.

Unit 3

Addition Reactions

Mechanistic and stereochemical aspects of addition reactions involving electrophiles, nucleophiles and free radicals, regio- and chemoselectivity, orientation and reactivity. Addition to cyclopropane ring. Hydrogenation of double and triple bonds, hydrogenation of aromatic rings. Hydroboration, Michael reaction, sharpless asymmetric epoxidation.

Unit-IV

Addition to Carbon-Hetero Multiple bonds

Addition to Carbon-Hetero Multiple bonds
 Mechanism of metal hydride reduction of saturated and unsaturated carbonyl compounds, acid esters and nitriles. Addition of Grignard reagents, organozinc and organolithium reagents to carbonyl and unsaturated carbonyl compounds. Wittig reaction. Mechanism of condensation reactions involving enolates-Aldol, Knoevenagel, Claisen, Mannich, Benzoin, Perkin and Stobbe reactions. Hydrolysis of esters and amides, ammonolysis of esters.

Elimination Reactions

Elimination Reactions
 The E2, E1 and E1 cb mechanisms and their spectrum. Orientation of the double bond.
 Reactivity-effects of substrate structures, attacking base, the leavign group and the
 medium. Mechanism and orientation in pyrolytic elimination.

Unit-V

Pericyclic Reactions

Molecular orbital symmetry, Frontier orbitals of ethylene, 1,3-butadiene, 1,3,5-hexatriene and allyl system. Classification of pericyclic reactions. Woodward-Hoffmann correlation diagrams. FMO and PMO approach. Electrocyclic reactions-conrotatory and disrotatory motions, $4n$, $4n+2$ and allyl systems. Cycloadditions-antarafacial and suprafacial additions, $4n$ and $4n+2$ systems, $2+2$ addition of ketenes, 1,3 dipolar antarafacial shifts of H, sigmatropic involving carbon moieties, 3,3- and 5,5 sigmatropic rearrangements. Claisen, Cope and aza-Cope rearrangements. Fluxional tautomerism.

Book Suggested

- * 12. Advanced Organic Chemistry-Reactions, Mechanism and Structure, Jerry March, John Wiley.
- 13. Advanced Organic Chemistry, F.A. Carey and R.J. Sundberg, Plenum.
- 14. A Guide Book to Mechanism in Organic Chemistry, Peter Sykes, Longman.
- 15. Structure and Mechanism in Organic Chemistry, C.K. Ingold, Cornell University Press.
- 16. Organic Chemistry, R.T. Morrison and R.N. Boyd, Prentice-Hall.
- 17. Modern Organic Reactions, H.O. House, Benjamin.
- 18. Principles of Organic Synthesis, R.O.C. Norman and J.M. Coxon, Blackie Academic & Professional.
- 19. Reaction Mechanism in Organic Chemistry, S.M. Mukherji and S.P. Singh, Macmillan.
- 20. Pericyclic Reactions, S.M. Mukherji, Macmillan, India
- 21. Stereochemistry of Organic Compounds, D. Nasipuri, New Age International.
- 22. Stereochemistry of Organic Compounds, P.S. Kalsi, New Age International.

Paper-VIII MCH-408: PHYSICAL CHEMISTRY II

m.m



Unit-I

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 reactions, kinetic salt effects, steady state kinetics, kinetic and thermodynamic control of reactions, treatment of unimolecular reactions. Dynamic chain (hydrogen-bromine reaction, pyrolysis of acetaldehyde, decomposition of ethane), photochemical (hydrogen-bromine and hydrogen-chlorine reactions) and homogeneous catalysis, kinetics of enzyme reactions, general features of fast reactions, study of fast reactions by flow method, relaxation method, flash photolysis and the nuclear magnetic resonance method, dynamics

21/04

Paper III

Paper-VIII III
MCH-408: PHYSICAL CHEMISTRY II

M.M. 35
40

Chemical Dynamics

Unit-I

Methods of determining rate laws, collision theory of reaction rates, steric factor, activated complex theory, Arrhenius equation and the activated complex theory; ionic reactions, kinetic salt effects, steady state kinetics, kinetic and thermodynamic control of reaction, pyrolysis of acetaldehyde, decomposition of ethano, photochemical (hydrogen-bromine reactions, general features of fast reactions, study of fast reactions by flow method, relaxation method, flash photolysis and the nuclear magnetic resonance method, dynamics

My copy the book Mol. At. P.T.O.
Ver. 21.04

of unimolecular reactions (Lindemann Hinshelwood and Rice-Ramsperger-Kassel-Marcus (RRKM) theories for unimolecular reactions).

Unit-II

Surface Chemistry

Adsorption

Surface tension, capillary action, pressure difference across curved surface (Laplace equation), vapour pressure of droplets (Kelvin equation), Gibbs adsorption isotherm, estimation of surface area (BET equation), Surface films on liquids (Electro-kinetic phenomenon).

Micelles

Surface active agents, classification of surface active agents, micellization, hydrophobic interaction, critical micellar concentration (CMC), factors affecting the CMC of surfactants, counter ion binding to micelles, thermodynamics of micellization-phase separation and mass action models, solubilization, micro emulsion, reverse micelles.

Unit-III

Macromolecules

Polymer-definition, types of polymers, electrically conducting, fire resistant, liquid crystal polymers, kinetics of polymerization, mechanism of polymerization. Molecular mass, number and mass average molecular mass, molecular mass determination (Osmometry, viscometry, diffusion and light scattering methods), sedimentation, chain configuration of macromolecules, calculation of average dimension of various chain structures.

Unit-IV

Non Equilibrium Thermodynamics

Thermodynamic criteria for non-equilibrium states, entropy production and entropy flow, entropy balance equations for different irreversible processes (e.g., heat flow, chemical reaction etc.), transformations of the generalized fluxes and forces, non equilibrium stationary states, phenomenological equations, microscopic reversibility and Onsager's reciprocity relations, electrokinetic phenomena, diffusion, electric conduction.

Unit-V

Electrochemistry

Electrochemistry of solutions. Debye-Hückel-Onsager treatment and its extension, ion-solvent interactions, Debye-Hückel-Jerum mode. Thermodynamics of electrified interface equations. Derivation of electro capillarity, Lippmann equations (surface excess), methods of determination. Structure of electrified interfaces.

Overpotentials, exchange current density, derivation of Butler Volmer equation, Tafel plot. Quantum aspects of charge transfer at electrodes-solution interfaces, quantization of charge transfer, tunneling. Semiconductor interfaces-theory of double layer at

semiconductor, electrolyte solution interfaces, structure of double layer interfaces. Effect of light at semiconductor solution interface. Polarography theory, Ilkovic equation; half-wave potential and its significance.



Unit-INuclear Magnetic Resonance Spectroscopy

Nuclear spin, nuclear resonance, saturation, shielding of magnetic nuclei, chemical shift and its measurements, factors influencing chemical shift, deshielding, spin-spin interactions, factors influencing coupling constant "j" Classification (AXB, AMX, ABC, A₂B₂ etc.), spin decoupling; basic ideas about instrument, NMR studies of nuclei other than proton-¹H, ¹³C, ¹⁹F and ³¹P. FT NMR, advantages of FT NMR.

Unit-IINuclear Quadrupole Resonance Spectroscopy

Quadrupole nuclei, quadrupole moments, electric field gradient, coupling constant, splitting. Applications.

Unit-IIIElectron Spin Resonance Spectroscopy

Basic principles, zero field splitting and Kramer's degeneracy, factors affecting the 'g' value. Isotropic and anisotropic hyperfine coupling constants, spin Hamiltonian, spin densities and Mc Connell relationship, measurement techniques, applications.

Unit-IVX-ray Diffraction

X-ray condition, Miller indices, Laue Method, Bragg method, Debye Scherrer method of X-ray structural analysis of crystals, index reflections, identification of unit cells from systematic absences in diffraction pattern, Structure of simple lattices and X-ray intensities, structure factor and its relation to intensity and electron density, phase problem. Description of the procedure for an X-ray structure analysis, absolute configuration of molecules.

Unit-VElectron Diffraction

Scattering intensity vs. scattering angle, Wierl equation, measurement technique, elucidation of structure of simple gas phase molecules. Low energy electron diffraction, structure of surfaces.

Neutron Diffraction Scattering of neutrons by solids measurement techniques, elucidation of structure of magnetically ordered unit cells.

Books suggested

11. Modern Spectroscopy, J.M. Hollas, John Wiley.
12. Applied Electron Spectroscopy for chemical analysis d. H. Windawi and F.L. Ho., Wiley Interscience.
13. NMR, NQR, EPr and Mossbauer Spectroscopy in Inorganic Chemistry, R.V. Parish, Ellis Harwood.
14. Physical Methods in Chemistry, R.S. Drago, Saunders College.
15. Chemical Applications of Group Theory, F.A. Cotton.

M.M

40

34

35

42

Unit-I

Introduction to computers and Computing

Basic structure and functioning of computer with a PC as illustrative example. Memory devices, Secondary storage Computer languages. Operating systems with DOS as an example (introduction to UNIX and WINDOWS). Principles of programming Algorithms and flow-charts.

Unit-II

Computer Programming in FORTRAN/CBASIC

(the language features are listed here with reference to FORTRAN. The instructor may choose another language such as BASIC or C the features may be replaced appropriately). Elements of the compute language. Constants and variables. Operations and symbols Expressions. Arithmetic assignment statement. Input and output Format statement. Termination statements. Branching statements as IF or GO TO statement. LOGICAL variables. Double precision variables. Subscripted variables and DIMENSION, DO statement. FUNCTION AND SUBROUTINE. COMMON and DATA statement (Student learn the programming logic and these language feature by hands on experience on a personal computer from the beginning of this topic.)

Unit-III

Programming in Chemistry

Developing of small computer codes using any one of the languages FORTRAN/C/BASIC involving simple formulae in Chemistry, such as Van der Waals equation. Chemical kinetics (determination of Rate constant) Radioactive decay (Half life and Average Life). Determination Normality, Molarity and Molality of solutions. Evaluation Electronegativity of atom and Lattice Energy from experimental determination of molecular weight and percentage of element organic compounds using its from experimental metal representation of molecules in terms of elementary structural features such as bond lengths, bond angles.

02/01/02

25

✓ 02/01/02

Unit-IV

Use of Computer programmes

Operation of PC. Data Processing. Running of standard Programs and Packages such as MS WORD, MS EXCEL -special emphasis on calculations and chart formations. X-Y Plot. Simpson's Numerical Integration method. Programmes with data preferably from physical chemistry laboratory.

Unit V

Answer

Application of Internet for Chemistry with search engines, various types of files like PDF, JPG, RTF and Bitmap. Scanning, OMR, Web camera.

Books Suggested :

Principles of Computer : V. Rajaraman (Prentice Hall)

Computers in Chemistry : K. V. Raman (Tata Mc Graw Hill)

Computer Programming in FORTRAN IV-V Rajaraman (Prentice Hall)

Ram
17-4-15

Mr. 17-4-15
2010
Mall
17-4-15

17-4-15
Ranu Ranu
17-4-15
Ranu Ranu

MSc IInd Sem CHEMISTRY

PRACTICAL.

(duration: 6-8 hrs in each branch)

Practical examination shall be conducted separately for each branch.

Inorganic Chemistry

Chromatography	12
Separation	12
Test	4
Viva Voce	5

Chromatography Separation of cations and anions by

Chromatography : Ion exchange.

Preparations

Preparation of selected inorganic compounds and their studies by I.R. electronic spectra, Raman, E.S.R. and magnetic susceptibility measurements. Handling of air and moisture sensitive compounds.

Appar 0220

1. $[\text{Co}(\text{NH}_3)_6] \text{[Co}(\text{NO}_2)_6]$
2. cis-[Co(trien) $(\text{NO}_2)_3\text{Cl}\text{.H}_2\text{O}$
3. $\text{Hg}[\text{Co}(\text{SCN})_4]$
4. $[\text{Co}(\text{Py})_3\text{Cl}_2]$
5. $[\text{Ni}(\text{NH}_3)_6]\text{Cl}_2$
6. $\text{Na}[\text{Al}(\text{C}_2\text{H}_5\text{O})_4]$
7. $[\text{Cu}(\text{NH}_3)_4]\text{SO}_4\text{.H}_2\text{O}$

Expt 2020

Expt 2020

Expt 2020

Organic Chemistry

Organic Synthesis	12
Quantitative Analysis	12
Test	4
Viva Voce	5

Organic Synthesis

Nucleophilic addition condensation: Dibenzal acetone from benzaldehyde. Sandmeyer reaction : p-Monobromoaniline from p-toluidine. Acetone ester Condensation : Synthesis of ethyl- α -benzylacetate by A.E.E. condensation. Cannizzaro reaction : 4-Chlorobenzenophenone to phenol. Friedel Crafts reaction : α -Benzoyl propionic acid from succinic anhydride and benzene. Aromatic electrophilic substitutions : Synthesis of p-nitroaniline and p-bromoaniline. The Products may be Characterized by Spectral Techniques.

Expt 0220

Expt 0220

Expt 0220

Expt 0220

Quantitative Analysis

Determination of the percentage or number of hydroxyl groups in an organic compound by titration method. Estimation of amines/phenols using bromate bromide solution/or titration method. Determination of iodine and Saponification values of an oil sample. Determination of DO, COD and BOD of water sample.

Physical Chemistry

Expt 2020

potentiometer
pH meter
conductometer
thermometer

5
4
3
2
1

Acetometry

Determination of the velocity constant, order of the reaction and energy of activation for saponification of ethyl acetate by sodium hydroxide conductometrically.

Determination of solubility and solubility product of sparingly soluble salts like PbSO_4 , BaSO_4 conductometrically.

Determination of the strength of strong and weak acid in a given mixture conductometrically.

To study of the effect of solvent on the conductance of AgNO_3 /acetic acid and to determine the degree of dissociation and equilibrium constant in different solvents and in their mixtures (DMSO, DMF, dioxane, acetone, water) and to test the validity of Debye-Hückel-Onsager theory.

Determination of the activity coefficient of zinc ions in the solution of 0.002 M zinc sulphate using Debye-Hückel's limiting law.

Potentiometry/pH metry

At 25°C
220

Determination of strengths of halides in a mixture potentiometrically. 515 0.01

Determination of the valency of mercurous ions potentiometrically. 520 0.01

Determination of the strength of strong and weak acids in a given mixture using a potentiometer/pH meter.

515
220

Determination of temperature dependence of EMF of a cell.

Determination of the formation constant of silver-ammonia complex and stoichiometry of the complex potentiometrically.

515
220

Acid-base titration in a non-aqueous media using a pH meter.

Determination of activity and activity coefficient of electrolytes.

515
220

Determination of the dissociation constant of acetic acid in DMSO, DMF, acetone and dioxane by titrating it with KOH.

Determination of the dissociation constant of monobasic/dibasic acid by Albert-idegant method.

515
220

Determination of thermodynamic constants, DG, DS, and DH for the reaction by m.f. method. $\text{Zn} + \text{H}_2\text{SO}_4 \rightarrow \text{ZnSO}_4 + 2 \text{H}_2\text{O}$

Enzyme

Determination of rate constant for hydrolysis/inversion of sugar using a spectrometer. 515 0.01

Enzyme kinetics-inversion of sucrose.

515
220
Determination of rate constant for hydrolysis/inversion of sugar using a spectrometer. 515 0.01
Enzyme kinetics-inversion of sucrose.

Department of Higher Education, Govt. of M.P.
Post Graduate Semester wise Syllabus
as recommended by Central Board of Studies and approved by the Governor of M.P.
योग्य विषय का सिलेबस
विषयानुसार विभिन्न विषयों का सिलेबस
विषयानुसार विभिन्न विषयों का सिलेबस

Session (वर्ष) 2019-2020 3-19 -20

Class / कक्षा : M. Sc.

Semester / विषयांक : III semester

Subject / विषय : Botany

Title of Subject Group : Plant Physiology

प्रिय विषय का विवरण

Paper No. / प्रत्येक विषय का नाम :

Compulsory / अनिवार्य या Optional / विकल्पीय अनिवार्य

Max. Marks अधिकार्य अंक : ५०

: Botany

: Plant Physiology

:

: PG 301

: Compulsory

~~३०००-१५-५०~~ ५० + १०

Particulars / विवर

Unit-1	Structure and functions of ATP. Plant water relations, mechanisms of water transport through xylem, root-microbe interactions in facilitating nutrient uptake. Membrane transport proteins.
Unit-2	Phloem transport, phloem loading and unloading, passive and active solute transport. Signal transduction; overview, receptors and proteins, phospholipids sensing, role of cyclic nucleotides, calcium-calmodulin cascade. Specific signaling mechanisms, for example, two-component sensor regulator system in bacteria and plants.
Unit-3	Plant growth regulators and elicitors. Physiological effects and mechanism of action of auxins, gibberellins, cytokinins, ethylene, abscisic acid, brassinosteroids, polyamines, jasmonic acid, and salicylic acid. Hormone receptors.
Unit-4	Flowering process, photoperiodism and its significance, endogenous clock and its regulation. Floral induction and development. Phytochromes and cryptochromes, their photochemical and biochemical properties. Role of vernalization.
Unit-5	Stress physiology. Plant responses to biotic and abiotic stress. Water deficit and drought resistance. Salinity stress and resistance. Concepts of freezing, heat and oxidative stresses.

1/08/2020

~~सुझाव-देते~~

Suggested Laboratory Exercise based on P.G. 301 :

i. Radiotracer methodology, autoradiography, instrumentation (GM counter & scintillation counter) and principles involved.

ii. Absorbance Principles of colorimetry, Spectrophotometry and Fluorimetry.

iii. Respiration 1. Determine rate of transpiration by Cameng's potometer.

1. 6/09/19 2. Determine rate of respiration in germinating/young buds by Cameng's respirometer.

1. Dr. C. O. Alodia 2. Dr. Archana Verma ऑफिसर

2. Dr. A. K. Patelia ऑफिसर

3. Dr. Ela Tiwari ऑफिसर

4. Dr. Anila Argawal ऑफिसर

5. Dr. Pritima Khare ऑफिसर

Dr. Abhishek
@grau

Department of Higher Education, Govt. of M.P.
 Post Graduate Semester wise Syllabus
 as recommended by Central Board of Studies and approved by the Governor of M.P.

One Year Degree पर्सनल

प्राचीन विद्या के लिए विवेक अंगुष्ठ विद्यालय
 निर्मल विद्यालय गो मंडिल तथा उ. & व. विद्यालय गो मंडिल

Session (वर्ष) 2010-2011 तक 19-20

Class / कक्षा	: M.Sc.
Semester / सेमेस्टर	: III semester
Subject / विषय	: Botany
Title of Subject Group	: Plant Biochemistry & Metabolism
विषय शाखा का शीर्षक	:
Paper No. / प्रश्नपत्र क्रमांक	: PG 302
Compulsory / अविवादी या Optional / विवादी विषय	: Compulsory
Max. Marks अधिकारी अंक	40
	40 + 10 = 50

Particulars / विवरण

Unit-1	Fundamentals of enzymology: allosteric mechanism, regulatory and active sites, isozymes, kinetics of enzymatic catalysis, Michaelis-Menten equation and its significance, Mechanism of enzyme action.
Unit-2	Photochemistry and photosynthesis: General concepts, evolution of photosynthetic apparatus, photosynthetic pigments and light harvesting complexes. Photodissociation of water, mechanism of electron and proton transport, Carbon assimilation, Calvin cycle, photorespiration and its significance, C ₄ -cycle, CAM pathway, physiological and ecological considerations.
Unit-3	Respiration and lipid metabolism: Overview of plant respiration, glycolysis, TCA cycle, electron transport and ATP synthesis, Oxidative pentose phosphate pathway, glyoxylate cycle, alternative oxidase system.
Unit-4	Structure and functions of lipids, fatty acid biosynthesis, structural lipids and storage lipids and their catabolism, Sulfate uptake, transport and assimilation.
Unit-5	Nitrogen fixation, nitrogen and sulphur metabolism (Overview, biological nitrogen fixation, nodule formation, Mechanism of uptake and reduction, ammonium assimilation,

Weight CO₂

Suggested Laboratory Exercise based on P.G 302 :

- 1. Effect of time and enzyme concentration on the rate of reaction of enzyme C e.g. acid Phosphatase, nitrate reductase.
- 2. Effect of substrate concentration on activity of any enzyme C (catalase, Amylase)
- 3. Demonstration of the substrate inducibility of the enzyme nitrate reductase
- 4. Determination of succinate dehydrogenase activity, its kinetics and sensitivity to inhibitors

17/09/19 ~~Dr. Prakash Verma~~ Dr. Prakash Verma ~~of phone~~

Dr. C. D. Athiq ~~or~~

Dr. A. K. Pateng ~~Act~~

Dr. Ela Tiwari ~~Act~~

Dr. Amita Argam ~~Act~~

Dr. Pratima Khare ~~Act~~

Department of Higher Education, Govt. of M.P.
 Post Graduate Semester wise Syllabus
 as recommended by Central Board of Studies and approved by the Governor of M.P.
 Date 16th June, 2019
 विद्यालय की दस्तावेज़ विषय
 फॉर एड्युकेशन के अधिकारी द्वारा दी गई विषय

Session (II) 2019-2020

Class / वर्षा : M.Sc.
 Semester / सेमेस्टर : III semester
 Subject / विषय : Botany
 Title of Subject Group : Genetics & Cytogenetics
 विषय समूह का नाम
 Paper No. / प्रश्नपत्र क्रमांक : PG 303
 Compulsory / अनिवार्य वा Optional / विकल्प अनिवार्य : Compulsory
 Max. Marks अधिकार्य अंक : 42 40

	Particulars / विवर
Unit-1	Genetics of prokaryotes and eukaryotes; genetic recombination in prokaryotes, genetic transformation, conjugation and transduction in bacteria. Genetics of mitochondria and chloroplasts; cytoplasmic male sterility.
Unit-2	Genetic recombination and genetic mapping in eukaryotes. Recombination, independent assortment and crossing-over, molecular mechanism of recombination. Chromosome mapping, linkage groups, genetic markers, construction of molecular maps, somatic cell genetics- an alternative approach to gene mapping.
Unit-3	Mutations spontaneous and induced mutations, physical and chemical mutagens, molecular basis of gene mutations. Transposable elements in prokaryotes and eukaryotes. Mutations induced by transposons, DNA damage and repair mechanisms.
Unit-4	Cytogenetics of numerical and structural changes of chromosomes. Euploidy, aneuploidy origin, meiosis and effect. Cytogenetics of deficiencies, duplication, inversions and translocation.
Unit-5	Molecular Cytogenetics. Nuclear DNA content, c-value paradox, col curve and its significance, restriction mapping – concept and techniques, multigene families and their evolution. Transfer of whole genome, examples from wheat and <i>Brassica, Arabidopsis</i> .

29/08/2020

Suggested Laboratory Exercise based on P.T., 2019 :

1. Isolation of DNA & preparation of $Y \times Y$ curve
2. Demonstration of SEM & TEM
3. Isolation of Mitochondria and its marker enzyme, succinate dehydrogenase (SDH)

1. Dr. S. D. Patwa
2. Dr. Bhawna - CCR

3. Dr. S. K. Srivastava
4. Dr. R. K. Tiwari
5. Dr. G. N. Pandit

6. Dr. S. K. Srivastava
7. Dr. Parichar C. Choudhury

8. Dr. S. K. Srivastava

9. Dr. C. D. Patwa

10. Dr. A. K. Patra Dr. Archana Verma Dr. S. K. Srivastava

11. Dr. S. K. Srivastava

12. Dr. Amita Aryanig

13. Dr. Pratima Khanal

Department of Higher Education, Govt. of M.P.
 Post Graduate Semester wise Syllabus
 as recommended by Central Board of Studies and approved by the Governor of M.P.
 dated 1st Dec., 1999
 विभागीय नियम द्वारा दिए गए सिलेबस
 जिसके अनुसार यह विषय और इसकी अवधि दी गई है।

Session (त्रि) 2019-2020

Class / शिल्प	: M.Sc.
Semester / ऋण्डित	: III semester
Subject / विषय	: Botany
Title of Subject Group	: Molecular Biology
Code नम्बर वा शीर्षक	:
Paper No. / प्रश्नपत्र क्रमांक	: PY-304
Compulsory / अनिवार्य वा Optional / विकल्प अनिवार्य	: Compulsory
Max. Marks अधिकतम 350	: 35+CHC+15=350 40% +10

Particulars / विवरण

Unit-1	DNA structure: A, B and Z forms; transcription; plant promoters and transcription factors; splicing; messenger RNA transport; ribosomal RNA biosynthesis
Unit-2	Gene structure and expression; genetic fine structure; cis-trans test; fine structure analysis of eukaryotes, introns and their significance; RNA splicing; regulation of gene expression in prokaryotes and eukaryotes.
Unit-3	Ribosomes structure and site of protein synthesis; mechanism of translation, initiation, elongation and termination; structure and role of transfer RNA; protein sorting; targeting of proteins to organelles
Unit-4	Cell cycle and apoptosis; control mechanisms; role of cyclins and cyclin dependent kinases; cytokinesis and cell plate formation; mechanism of programmed cell death; DNA replication in prokaryotes and eukaryotes
Unit-5	Immunotechniques; In situ hybridization – concepts and techniques; physical mapping of genes on chromosomes; In situ hybridization to locate transcript in cell types; FISH; Flow cytometry

Suggested Laboratory based on PY-304:

1. Isolation of genomic DNA from plant tissue using CTAB (cetyltri methyl ammonium bromide) or ~~Alu~~ ~~Alu~~ ~~Alu~~ animal tissue.
2. Isolation of DNA & its quantitation by a spectrophotometric method.
3. Restriction digestion of plant DNA, its separation by Agrose gel electrophoresis and visualization by ethidium bromide staining.
4. Isolation of RNA and quantitation by a spectrophotometric method.
5. Separation of RNA by Agrose gel electrophoresis and visualization by Et. Br. staining.
6. Immunological techniques: Double antibody method, ELISA & western blotting.
7. Isolation of chloroplasts and SDS-PAGE profile of proteins to demonstrate the two subunits of Rubisco.

Other experiments based on theory paper.

- 1 - Dr. C. D. Afing *C. D. Afing* Dr. Archana Verma *Archana Verma*
- 2 - Dr. Archang Viermg *Archang Viermg*
- 3 - Dr. A. K. Pateng *A. K. Pateng*
- 4 - Dr. Ela Tiwari *Ela Tiwari*
- 5 - Dr. Amita Argarwal *Amita Argarwal*
- 6 - Dr. Pratima Kharde *Pratima Kharde*

Department of Higher Education

Ministry of Higher Education, Govt. of M.P.
Post Graduate Semester-wise Results

**III Graduate Semester wise Syllabus
as recommended by Central Board of Studies and approved by Government of India**

... or others and approved by
the State Street Corp.

८३ राजा विनाय, राजा विनाय

कृष्णपाल कलाम के लिये सीनेस्टर अनुसार पाठ्यक्रम

कलाय अवधिन सम्पूर्ण हुया अनुशासित तथा म. प. की राज्यपाल द्वारा अनुचित

Session (xx) 2010–2011

०२/२३

[Signature] 29/9/2020

12/19/2000

~~2011-02-22~~

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 biphenyl-like compounds.
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 nuclides with emphasis on ^{193}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 EI, CI, FD, ES1 and FAB. Mass spectral factors affecting fragmentation, ion analysis, ion abundance. Mass spectral fragmentation of organic compounds, common functional groups, molecular ion peak, metastable peak, Mc Lafferty rearrangement. Nitrogen rule. High resolution mass spectrometry. Structure elucidation of simple molecules using UV - Visible, IR, NMR and mass spectral techniques.

Department of Higher Education, Govt. of M.P.
 Post Graduate Semester wise Syllabus
 as recommended by Central Board of Studies and approved by the Governor of M.P.
 उत्तर प्रदेश प्रियांशु, M.P. राजसभा
 स्नातकोत्तर कार्यालय के द्वारा अनुमति दिए गए अनुसार पाठ्यक्रम
 कैंटीय अध्ययन मण्डल द्वारा अनुरूपित तथा M.P. के राज्यपाल द्वारा अनुमोदित
 Session (सत्र) 2010-2011

Date / तिथि
 Semester / सेमेस्टर
 Subject / विषय
 Name of Subject Group
 M.P. समूह का वीरेक
 Paper No. / प्राप्तवाच क्रमांक
 Compulsory / अनिवार्य या Optional / वैकल्पिक अनिवार्य
 M.M. Marks अधिकाराम अंक

: M.Sc.
 : IV
 : Chemistry
: SOLID STATE CHEMISTRY
 :
 : II (Code- MCH-512)
 : Compulsory
 : 60^o 25^o 40^o 40^o
 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.

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

Dr. Rakesh Kumar
 17-4-11

Dr. Rakesh Kumar
 09-8-12
 Dr. Rakesh Kumar
 17-4-11
 Prof. M. D.
 15-4-11
 Dr. Rakesh Kumar
 17-4-11
 Dr. Rakesh Kumar
 17-4-11

Department of Higher Education, Govt. of M.P.
 Post Graduate Semester wise Syllabus
 as recommended by Central Board of Studies and approved by the Governor of M.P.
 राज्य शिक्षा परिषद, वडा, इंदौर
 केंद्रीय अधारान पश्चात् द्वारा अनुमति ले उ. प. के राज्यपाल द्वारा अनुमोदित
 Session (सत्र) 2010-2011

Class : डॉक्टर	: M.Sc.
Semester / सेमेस्टर	: IV
Subject / विषय	: Chemistry
Title of Subject Group	: BIOCHEMISTRY
भौत विज्ञान का विभाग	:
Paper No. / प्रश्नपत्र नंबर	: III (Code- MCH-S13)
Compulsory / अनिवार्य या Optional / वैकल्पिक अनिवार्य	: Compulsory
Max. Marks अधिकारी अंक	: 50
Particulars / विवरण	
Unit-1	<p>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.</p> <p>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.</p> <p>Transport and Storage of Dioxygen 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 Structure and function of metal of proteins in electron transport processes cytochrome's and ion-sulphur proteins, synthetic models.</p> <p>Nitrogen fixation Biological nitrogen fixation, and its mechanism, nitrogenase, Chemical nitrogen fixation.</p>
Unit-3	<p>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 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, Michaelis-Menten and Lineweaver-Burk plots, reversible and irreversible inhibition.</p> <p>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 chymotrypsin, ribonuclease, lysozyme and carboxypeptidase.</p> <p>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, β-Cleavage and condensation; some isomerization and rearrangement reactions. Enzyme catalyzed carboxylation and decarboxylation.</p>

Dr. P. S. Patel M.A., M.Phil., Ph.D., P.G.T., A.I.R.E., R.R.U. 2010-2011

B.Sc. 02/20

Department of Higher Education, Govt. of M.P.
Post Graduate Semester wise Syllabus
as recommended by Central Board of Studies and approved by the Governor of M.P.
काशी विद्या एवं प्रशिक्षण बोर्ड, M.P. राजस्व
कैरियर विभाग द्वारा संचालित एवं प. ए. ए. विभाग द्वारा अनुमोदित
कैरियर विभाग द्वारा संचालित एवं प. ए. ए. विभाग द्वारा अनुमोदित
Session (एस) 2010-2011

P.G. 2/20
1/2/20
1/2/20
1/2/20
1/2/20
1/2/20
1/2/20
1/2/20

Co-Enzyme Chemistry

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. 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.

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 cheese-making, syrups from corn starch, enzymes as targets for drug design. Clinical uses of enzymes, enzyme therapy, enzymes and recombinant DNA Technology.

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 binding 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, I. 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. Bioinorganic 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, John Wiley.

Enzymatic Reaction Mechanisms. C. Walsh. W.H. Freeman.

Feb 2011 Reprint
Miller M.D.

Spring

Summer

BB
original

Department of Higher Education, Govt. of M.P.
 Post Graduate Semester wise Syllabus
 as recommended by Central Board of Studies and approved by the Governor of M.P.
 उच्च शिक्षा विभाग, म.प्र. शासन
 बनातायीतर कामों के लिये संवेदना अनुसार घटयात
 एटोर अध्ययन पाठ्यक्रम द्वारा अनुसारित है। म.प्र. के शिक्षापाल द्वारा अनुमोदित
 Session (सत्र) 2010-2011

1.01 Readings:

- 1. Designing Organic Synthesis, S. Warren, Wiley.
- 2. Organic Synthesis: Concept, Methods and Starting Materials, J. Fuhrhop.
- 3. 300 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.

: M.Sc.

: IV

: Chemistry

Chemistry of Natural Products

:

: OPT-2 (Code- MCH-S15)

: Optional

: 50

: ३५
ग्राह / लेस्टर

: विषय

: विषय का शीर्षक

: इसलियन नामांक

: विषय / अनिवार्य या Optional / वैकल्पिक अनिवार्य

: विषय का विवरण अंक ५०

Particulars / विवरण

1	Terpenoids and Carotenoids Classification, nomenclature, occurrence, isolation, general methods of structure determination, isoprene rule. Structure determination, stereochemistry, biosynthesis and synthesis of the following representative molecules : Citral, Geraniol α -Terpenol, Menthol, Farnesol, Zingiberene, Santonin, Phytol, Abietic acid and β -Carotene.
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, (+)-Cinchona, Nicotine, Atropine, Quinine and Morphine.
3	Steroids Occurrence, nomenclature, basic skeleton, Diels hydrocarbon and stereochemistry, Isolation, Structure determination and synthesis of Cholesterol, Bile acids, Androsterone, Testosterone, Estrone, Progesterone, Aldosterone, Biosynthesis of Steroids.
4	Plant Pigments Occurrence, nomenclature and general methods of structure determination. Isolation and synthesis of Apigenin, Luteolin, Quercetin, Myricetin, Quercetin 3-glucoside, Vitexin, Diadzein, Aucubin, Cyanidin-Tarabinoside, Cyanidin, Hirsutidin. Biosynthesis of Flavonoids: Acetate pathway and Shikimic acid pathway.
5	Protoporphyrins Structure and synthesis of Haemoglobin and Chlorophyll.
6	Prostaglandin Occurrence, nomenclature, classification, biogenesis and physiological effects. Synthesis of PGF2 α and PGF2 β .
7	Pyrethrins and Rotenones Synthesis and reactions of Pyrethrins and Rotenones. (For structure elucidation, emphasis is to be placed on the use of spectral parameters wherever possible).

1.02 Readings:

1.01 Readings
 1.02 Readings
 1.03 Readings
 1.04 Readings
 1.05 Readings
 1.06 Readings
 1.07 Readings
 1.08 Readings
 1.09 Readings
 1.10 Readings
 1.11 Readings
 1.12 Readings
 1.13 Readings
 1.14 Readings
 1.15 Readings
 1.16 Readings
 1.17 Readings
 1.18 Readings
 1.19 Readings
 1.20 Readings
 1.21 Readings
 1.22 Readings
 1.23 Readings
 1.24 Readings
 1.25 Readings
 1.26 Readings
 1.27 Readings
 1.28 Readings
 1.29 Readings
 1.30 Readings
 1.31 Readings
 1.32 Readings
 1.33 Readings
 1.34 Readings
 1.35 Readings
 1.36 Readings
 1.37 Readings
 1.38 Readings
 1.39 Readings
 1.40 Readings
 1.41 Readings
 1.42 Readings
 1.43 Readings
 1.44 Readings
 1.45 Readings
 1.46 Readings
 1.47 Readings
 1.48 Readings
 1.49 Readings
 1.50 Readings
 1.51 Readings
 1.52 Readings
 1.53 Readings
 1.54 Readings
 1.55 Readings
 1.56 Readings
 1.57 Readings
 1.58 Readings
 1.59 Readings
 1.60 Readings
 1.61 Readings
 1.62 Readings
 1.63 Readings
 1.64 Readings
 1.65 Readings
 1.66 Readings
 1.67 Readings
 1.68 Readings
 1.69 Readings
 1.70 Readings
 1.71 Readings
 1.72 Readings
 1.73 Readings
 1.74 Readings
 1.75 Readings
 1.76 Readings
 1.77 Readings
 1.78 Readings
 1.79 Readings
 1.80 Readings
 1.81 Readings
 1.82 Readings
 1.83 Readings
 1.84 Readings
 1.85 Readings
 1.86 Readings
 1.87 Readings
 1.88 Readings
 1.89 Readings
 1.90 Readings
 1.91 Readings
 1.92 Readings
 1.93 Readings
 1.94 Readings
 1.95 Readings
 1.96 Readings
 1.97 Readings
 1.98 Readings
 1.99 Readings
 1.00 Readings

Department of Higher Education, Govt. Of M.P.
Post Graduate Semester Wise Syllabus
as recommended by Central Board of Studies and approved by the Governor of M.P.
(As per recommended by Board of Studies held on 02/09/2020)
For Session -2020-21

Class / कक्षा	: M.Sc.
Semester / सेमेस्टर	: IV
Subject / विषय	: Chemistry
Title of Subject Group	: Medicinal Chemistry
Vishay सम्बूह का शीषक	
Paper No. / प्रश्नपत्र क्रमांक	: V, OPT-5 (Code- MCH-518)
Compulsory / अनिवार्य वा Optional / वैकल्पिक अनिवार्य	: Optional
Max. Marks / अधिकतम अंक	: 40

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, sulphonamides, membrane active drugs, drug metabolism, xenobiotics, biotransformation, significance of drug metabolism in medicinal chemistry.
Unit-3	Antibiotics and antibacterials Introduction, Synthesis applications and adverse effects of Antibiotic- β -Lactam type – Penicillins, Cephalosporins, Antitubercular – Streptomycin, Broad spectrum antibiotics – Tetracyclines, Anticancer – Dactinomycin (Actinomycin D)
Unit-4	Antifungal – Introduction, Synthesis and applications of polyenes, Antibacterial- Ciprofloxacin, Norfloxacin, Antiviral – Acyclovir Antimalarials : Chemotherapy of malaria. SAR. Chloroquine, Chloroguanide and Mefloquine
Unit-5	Non-steroidal Anti-inflammatory Drugs : Introduction, Synthesis and applications of Diclofenac Sodium, Ibuprofen and Nefopam Antihistaminic and antiasthmatic agents : Introduction, Synthesis and applications of Terfenadine, Cinnarizine, Salbutamol and Beclomethasone dipropionate.

~~John~~ 2/28 ~~John~~ 06/9/10
John 02/09/2010 John 06/9/10
~~John~~ ~~John~~ ~~John~~

Department of Higher Education, Govt. of M.P.
 Post Graduate Semester wise Syllabus
 as recommended by Central Board of Studies and approved by the Governor of M.P.
 उच्च शिक्षा विभाग, म.प. सरकार
 स्नातकोत्तर योग्यता के लिए सेमेस्टर अनुसार पाठ्यक्रम
 कैटीया प्रयोग सभाल द्वारा अनुरूपित गया ह. प. फैल राज्यालय द्वारा अनुरूपित
 Session (वार) 2010-2011

M.Sc. Semester IV
Chemistry
Practical

(hrs in each branch)

Examination shall be conducted separately for each branch.

Inorganic Chemistry

	Max Marks - 33
Inorganic Determinations	12
Organic Determinations	12
Practicals	04
Project	05
Total	33

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

amide. Inorg. Synth., 1946, 2, 128.

Absorption analysis of Mg and Ca.

: of trichlorodiphenylantimony (V) hydrate. Inorg. Synths., 1985, 23, 194

ethionate $\text{Na}_3\text{S}_4\text{O}_6$.

plex of dimethyl sulfoxide : $\text{CuCl}_2 \cdot 2\text{DMSO}$ J.Chem. Educ., 1982, 59, 57.

: of metal acetylacetone : Inorg. Synths., 1957, 5, 130. 1963, 1, 183.

ms $[\text{Co}(\text{en})_2\text{Cl}_2]^+$.

ation of Cr (III) complex. $[\text{Cr}(\text{H}_2\text{O})_6]\text{NO}_3 \cdot 3\text{HO}$. Inorg. synths., 1972, 13, 184.

and use of Ferrocene. J. Chem. Edu. 1966, 43, 73; 1976, 53, 730.

ns of $[\text{Co}(\text{phenanthroline}-5,6 \text{ quinone})]$.

Inorganic Determinations / Spectroscopic identification of recorded spectra like IR, NMR,

%Chromium in steel sample.

Extractive spectrophotometric method.

Nitrite/phosphate.

ethylene diamine complex : Slope-ratio method.

Organic Determinations

nd potassium when present together.

alium/barium/strontium.

and magnesium in tap water.

*Ans: Feb 2011
Subject: Organic
Supervisor: Prof. Dr. Rakesh Kumar
Date: 20/02/2011*

IV Semester

Department of Higher Education, Govt. of M.P.
Post Graduate Semester wise Syllabus
as recommended by Central Board of Studies and approved by the Governor of M.P.
प्राचीन विद्यालय, भोपाल, मध्य प्रदेश
विद्यालय कानूनी विषय संस्करण अनुसार वार्षिक
विद्यालय कानूनी विषय संस्करण अनुसार वार्षिक
Session (वर्ष) 2010-2011

*B.S. 2010
2/2/2010*

Chemistry

Ques 1
Ques 2

Max Marks - 34
13
12
04
05
34

*2/2/2010
2/2/2010*

*2/2/2010
2/2/2010*

2/2/2010

Determination of PK_a of an indicator (e.g. methyl red) in (a) aqueous and (b) micellar media.

Determination of stoichiometry and stability constant of Ferricisochloroazotan complex ion in solution.

Determination of rate constant of alkaline bleaching of Malachite green and effect of ionic strength on the rate of reaction.

Kinetics

Determination of rate constant and formation constant of an intermediate complex in the reaction of Cr(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 and entropy of activation from a single kinetic run.

Theories of an enzyme catalyzed reaction.

*2/2/2010
2/2/2010*

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).

2/2/2010

Polarography

Determination and estimation of metal ions such as Cd+2, Pb+2, Zn+2, and I+2 etc.

polarographically.

Determination of a metal ligand complex polarographically (using Lingane's Method).

2/2/2010

Spectroscopy

Inorganic Experiments, J. Derek Woolings, VCH.

Macrocyclic Inorganic Chemistry, Z. Szafran, R.M. Pike and M.M. Singh, Wiley.

Inorganic Chemistry, G. Marr and B. W. Rickett, Van Nostrand.

Practical Inorganic Chemistry, G. Marr and B. W. Rickett, Van Nostrand.

Practical Systematic Identification of Organic Compounds, R.L. Shriner and D.Y. Curtin.

31/5/2010

Department of Higher Education, Govt. of M.P.
 Post Graduate Semester wise Syllabus
 as recommended by Central Board of Studies and approved by the Governor of M.P.
 गोपनीय मंत्री द्वारा सुनिश्चित अनुमति प्राप्त करने
 और उचित ढंग से दिये गये इन सिलेक्स अनुसार विद्यार्थी अनुसार
 Session (वार्ष) 2010-2011

Dr. S. K. Singh
 2010
 20

Syllabus	Max Marks - 33
Synthesis of Organic Compounds	12
Spectrophotometric Determinations	12
	04
	05
	33

Final 2010
14-10-2010

~~Part I~~ / 2010
14-10-2010

~~Expt No.~~
~~Value~~
0 L. T. C.

~~Specioli~~
11/11/2010

~~Supplg.~~
~~Rikarwala~~
11/11/2010

Synthesis of Organic Compounds

Will illustrate the use of organic reagents and may involve purification of the products by various techniques. Photochemical reaction Benzophenone \rightarrow Benzpinacol \rightarrow Benzpinacolone
 Rearrangement : Benzanilide from benzene Benzene \rightarrow Benzophenone \rightarrow Benzophenone oxime
 Acrylic acid rearrangement : Benzoic acid from benzoin Benzoin \rightarrow Benzylic acid
 Heterocyclic compounds Skraup synthesis : Preparation of quinoline from aniline Fisher Indole
 Preparation of 2-phenylindole from phenylhydrazine. Enzymatic synthesis Enzymatic synthesis
 Reduction : reduction of ethyl acetoacetate using Baker's yeast to yield enantiomeric excess of S-ethyl butanoate and determine its optical purity. Biosynthesis of ethanol from sucrose.
 Microwave Alkylation of diethyl malonate with benzyl chloride. Synthesis using phase transfer
 Alkylation of diethyl malonate or ethyl acetoacetate with an alkyl halide.

Qualitative analysis of organic compounds by the analysis of their spectral data (UV, IR, PMR, CMR & MS)
 Quantitative (UV/VIS) Estimations/isolation of the following (any one compound)

Estimation

Carbohydrates

Proteins

Hydrogen peroxide

Acetic acid

Urea

Ammonium

~~Prasad~~
11/11/2010
~~J. R.~~
11/11/2010

- from milk
- from tomato
- from black pepper
- from tea leaves
- from milk

Abhishek
14-10-2010