SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY,
NANDED

CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER PATTERN
Post Graduate (PG) Programme in Chemistry
(Affiliated Colleges)
w. e. f. Academic year 2015-16

SYLLABUS FOR
M. Sc. PART – II
ORGANIC CHEMISTRY

Board of Studies in Chemistry
Swami Ramanand Teerth Marathwada University, Nanded

Choice Based Credit System (CBCS)

Draft Syllabus Prescribed for

M. Sc. Second Year, ORGANIC CHEMISTRY

Semester-III & IV

2. ORGANIC CHEMISTRY (SEMISTER III & IV)

Semester	Paper	Course No.	Course	Periods / week	Total Periods	Credit
Theory III	XV	CH-531	Advanced Spectroscopic Methods	04	60	04
	XVI	CH-532/2	Natural Product	04	60	04
	XVII	CH-533/2	Organic Synthesis-I	04	60	04
	XVIII	CH-534/2	Elective Paper (any one)			
			A] Medicinal Chemistry	04	60	04
			B] Polymer Chemistry	04	60	04
	XIX		Seminar			01
					Total	**17**
Theory IV	XX	CH-541/2	Advanced Heterocyclic Chemistry	04	60	04
	XXI	CH-542/2	Bio-organic & Green Chemistry	04	60	04
	XXII	CH-543/2	Organic Synthesis-II	04	60	04
	XXIII	CH-544/2	Elective Paper (any one)			
			A] Medicinal Chemistry	04	60	04
			B] Polymer Chemistry	04	60	04
	XXIV		Seminar			01
					Total	**17**
Practical III & IV	XXV	CH-501/2	Laboratory Course-V	06	132	04
	XXVI	CH-502/2	Laboratory Course-VI	06	132	04
	XXVII	CH-503/2	Laboratory Course-VII	06	132	04
	XXVIII	CH-504/2	Laboratory Course-VIII	06	132	04
					Total	**16**
					Grant Total	**50 Credits**

Instructions

I] Each Laboratory Course of 6 Hrs duration should be completed in 6 Hrs per day.

II] Assessment shall consist of continuous assessment (CA) and end of Semester examination (ESE).

III] 75% for ESE and 25% for CA.

IV] Paper-(Elective): Transfer of credit as per student choice.

V] Evaluation of Seminar should be from panel of experts.

Draft Syllabus Prescribed for

M. Sc. Second Year, ORGANIC CHEMISTRY

Semester-III & IV

2. ORGANIC CHEMISTRY (SEMISTER III & IV)

Semester	Paper	Course No.	External (ESE)	Internal (CA)	Total Credits (Marks)
Theory III	XV	CH-531	75 Marks	2 Tests: 15 marks + Assignment: 10 Marks = 25 marks	04 (100)
	XVI	CH-532/2	75 Marks	2 Tests: 15 marks + Assignment: 10 Marks = 25 marks	04 (100)
	XVII	CH-533/2	75 Marks	2 Tests: 15 marks + Assignment: 10 Marks = 25 marks	04 (100)
	XVIII	CH-534/2	75 Marks	2 Tests: 15 marks + Assignment: 10 Marks = 25 marks	04 (100)
	XIX		25 Marks		01
Theory IV	XX	CH-541/2	75 Marks	2 Tests: 15 marks + Assignment: 10 Marks = 25 marks	04 (100)
	XXI	CH-542/2	75 Marks	2 Tests: 15 marks + Assignment: 10 Marks = 25 marks	04 (100)
	XXII	CH-543/2	75 Marks	2 Tests: 15 marks + Assignment: 10 Marks = 25 marks	04 (100)
	XXIII	CH-544/2	75 Marks	2 Tests: 15 marks + Assignment: 10 Marks = 25 marks	04 (100)
	XXIV		25 Marks		01
					17
Practical III & IV	XXV	CH-501/2	75 Marks	2 Tests: 25 marks	04 (100)
	XXVI	CH-502/2	75 Marks	2 Tests: 25 marks	04 (100)
	XXVII	CH-503/2	75 Marks	2 Tests: 25 marks	04 (100)
	XXVIII	CH-504/2	75 Marks	2 Tests: 25 marks	04 (100)
Total Credts Sem III & IV + Lab Course = 17 + 17 + 16 = 50					

M. Sc. Second Year, Semester-III
Paper–XV, [CH-531]
Advanced Spectroscopic Methods

Credits: 04 **Periods: 60**

SM-1: UV-Vis Spectroscopy:
SM-2: IR spectroscopy:
SM-3: NMR Spectroscopy (Organic):
SM-4: NMR Spectroscopy (Inorganic):
SM-5: Mass Spectroscopy:
SM-6: Moissabaur Spectroscopy:
SM-7: Structural problems:

SM-1: UV-Vis Spectroscopy: 06P

Fieser-Woodward rules for conjugated dienes and carbonyl compounds, Fieser-Kuhn rules for polyenes. UV spectra of aromatic compounds and heteroaromatic compounds. Calculation of λ_{max} for the benzene derivatives ($R\text{-}C_6H_4\text{-}Co\text{-}G$) by A. I. Scott emperical rules.

SM-2: IR spectroscopy:

Organic IR spectroscopy: Recapitulation, Characteristic vibration 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, anhydride, Lactose, lactams and conjugated carbonyl compounds. Factors affecting group frequencies: overtones, combination bands and Fermi-resonance. FITR and sampling technique. **06P**

Inorganic IR spectroscopy: Structural information from vibrational spectra: Group frequencies, Characteristic band stretching frequencies, Mode of vibrations of linear and non-linear molecules, deformation, frequencies of carbonyl metal complexes, pattern of group frequencies, mode of bonding of ambidentate ligands, Cynides, Ethylenediamine and Diketone complexes. **04P**

SM-3: NMR Spectroscopy (Organic): 14P

a) ^{1}H NMR: General introduction and definations, Chemical shift, Spin-spin interaction, shielding mechanism of measurement of chemical shift values and correlation for protons bonded to carbon (aliphatic, olefinic, aldehyde and aromatic) and other nuclei (alcohols, phenols, enols, carboxylic acids, amines, amides and mercapto). Factors affecting chemical shift. Deuterium exchange. Spin-spin coupling, factors affecting coupling constant. Complex spin-spin interaction between two and three nuclei. Simplification of complex spectra, nuclear magnetic double resonance, contact shift reagents, solvent effects. Fourier transform technique. Nuclear Over-Hauser effect (NOE). Resonance of other nuclei; ^{19}F and ^{31}P.

b) ^{13}C NMR: Resolution and multiplicity of ^{13}C NMR, 1H-decoupling, noise decoupling, broad band decoupling; Deuterium, fluorine and phosphorus coupling; NOE signal enhancement, off-resonance, proton decoupling, Structural applications of CMR. DEPT; Introduction to 2D-NMR: COSY, NOESY, DEPT, INPET, APT, INADEQUATE.

SM-4: NMR Spectroscopy (Inorganic): 06P

a) Basic principle of NMR spectroscopy and applications to Paramagnetic compounds and metal nuclei of Pt ^{195} and Sn ^{119}.
b) Basic principle and applications of ESR spectroscopy to different free radical molecules and transition metal ion complexes.

SM-5: Mass Spectroscopy: 08P

Theory, instrumentation and modifications; Unit mass and molecular ions; Important terms- singly and doubly charged ions, metastable peak, base peak, isotropic mass peaks, relative intensity, FTMS, etc.; Recognition of M+ ion peak; General fragmentation rules: Fragmentation of various classes of organic molecules, including compounds containing oxygen, sulphur, nitrogen and halogens; α-, β-, allylic and benzylic cleavage; McLafferty rearrangement.

SM-6: Moissabaur Spectroscopy: 06P

Basic priniciple of Moissabaur Spectroscopy, applications on the basis of isomer shifts, electric quadrupole interactions. Elucidation of structure of $I_2Br_2Cl_4$, I_2Cl_6, Fe^{+2} and Fe^{+3} complexes and Sn^{+2} and Sn^{+4} compounds

SM-7: Structural problems: 10P

a) Combined problems on UV, IR, NMR and Mass spectral data for structure determination.
b) Elucidition of structure of organic molecules using spectra (IR & NMR).

Reference Books:

1. Spectroscopic identification of Organic Compounds, R. M. Silverstern, G. C. Bassler and T. C. Morril.
2. Introduction to NMR spectroscopy, R. J. Abraham, J. Fisher and P. Loftus.
3. Application of spectroscopy of organic compounds – J. R. Dyer.
4. Spectroscopy of organic compounds, P. S. Kalsi.
5. Organic Spectroscopy, William Kamp.
6. Organic Chemistry, R. T. Morrison and R. N. Boyd.
7. Practical NMR spectroscopy, M. L. Martin, J. J. Delpench and G. J. Martin.
8. Spectroscopic methods in organic Chemistry, D. H. William, I. Fleming.
9. Fundamentals of Molecular spectroscopy – C.N.Banwel

M. Sc. Second Year (Semester-III)
Paper–XVI [CH-532/2]
Natural Products

Credits: 04 **Periods: 60**

NP-1: Vitamins:
NP-2: Terpenoids and Carotenoids:
NP-3: Alkaloids:
NP-4: Steroids:
NP-5: Plant pigments:
NP-6: Prostaglandins, pyrethoids, Rotenones and pheromones.

NP-1: Vitamins: 08P
Classification, Occurrence Chemistry of Vitamins A, C and E Structure elucidation and synthesis. Deficiency syndromes etc.

NP-2: Terpenoids and Carotenoids: 12P
Classification, nomenclature, Occurrence, isolation, isoprene rule, structure determination, stereochemistry and biogenesis of the following molecules Citral, Camphor, Menthol, Farnesol, Zingiberene, Abietic acid. Biosynthesis of terpenoids

NP-3: Alkaloids: 08P
Structure, stereochemistry and synthesis of quinine and morphine

NP-4: Steroids: 12P
Occurrence, Nomenclature, Basic Skeleton, Diel's hydrocarbon and Stereochemistry. Structure determination and synthesis of Cholesterol, Bile acid, Androsterone, Testosterone, Oestrone, Aldosterone and Progesterone.

NP-5: Plant pigments: 10P
Occurrence, nomenclature and general methods of structure determination of Anthocyanidins. Synthesis of Cyanidin Chloride, Chalcones, Flavones, Quercetin.

NP-6: Prostaglandins, pyrethoids, Rotenones and pheromones. 10P
Occurrence, classification. Biogenesis, physiological effects and synthesis of PGE_2 and PGF_{2z}. Natural and synthetic of pyrethroids, Rotenones and pheromones. Synthesis of bombykol.

Books Suggested:

1. Natural products : Chemistry and Biological significance, J. Mann, R. S. Davidson, J. B. Hobbs, D. V., Banthropde & J. B. Harborne.
2. Organic Chemistry, vol-2, I. L. Finar.
3. Stereoselective synthesis: a practical Approach, M. Nogrudi.
4. Rodd's Chemistry of carbon compounds, Ed. S. Coffey.
5. Chemistry, Biological and Pharmacological properties of Medicinal plants from the Americans, Ed. Kurt. Hostettmann, M. P. Gupta and A. Marston.
6. Introduction to Flavonoids, B. A. Bohm.
7. Neco trends in natural products Chemistry, Ata-ur-Rahaman and M. I. Choudhary.

M. Sc. Second Year, Semester-III
Paper–XVII; CH-533/2
Organic Synthesis- I

Credits: 04 **Periods: 60**

OS-1: Transformations and Rearrangements:
OS-2: Selective Organic Reactions:
OS-3: Oxidation:
OS-4: Reduction:

OS-1: Transformations and Rearrangements: 18P

General Mechanistic Consideration, Nauture of migration, migratory aptitude, streochemical aspects and Memory Effects of following rearrangements

1.1 Introduction types and classification of rearrangements.

1.2 Rearrangement to Electron Deficient Carbon: Pinacol-pinacolone, Wagner-Meerwein, Benzillic acid, Wolf (Arndt–Eisterts Synthesis) Rupe and Demjanov Rearrangements.

1.3 Rearrangement to Electron Deficient Nitrogen: Hofman, Curtius, Schimdt, Lossen and Beckmann rearrangements

1.4 Rearrangement to Electron Deficient Oxygen: Baeyer-Villiger rearrangement.

1.5 Rearrangement to Electron Rich Carbon: Fovorskii, Wittig, Neber and Steven's rearrangements.

1.6 Aromatic Rearrangement: Fries, Clasisen and Benzidine rearrangement.

OS-2: Selective Organic Reactions: 16P

Mechanism, Sterochemistry and Synthetic Applications of following reactions

2.1 Stork Enamine, Chichibabin, Diels-Alder, Bucherer, Ullmann, Shapiro, Barton, Chugaev, Biginelli, Prins, Hunsdiecker Reactions.

2.2 Negishi, Suzuki, Buchwald-Hartwig Cross, Stille, Heck chan -Lam coupling reactions.

OS-3: Oxidation: 14P

Introduction, different oxidative processes.

3.1 Alcohols to carbonyl compounds: Chromium (VI) oxidants, Dimethyl sulfoxide and its modifications (Swern Oxidation), Mangnese (IV) oxide, Silver carbonate, Hypervalent iodine(III) and (V) reagents cerric ammonium nitrate (CAN).

3.2 Alkenes to epoxides: Peroxide induced epoxidation-epoxidation by H_2O_2, hydroperoxides and peroxyacids.

3.3 Alkenes to diols: oxidation by potassium permanganate, Osmium tetraoxide and its streochemical consideration , Prevost oxidation and Woodward modifications.

3.4 Oxidative cleavge of 1,2-diols: Periodic acid.

3.5 Oxidation of allylic and benzylic C-H bonds: NBS, DDQ, Chloranil T, SeO_2.

OS-4: Reduction: 12P

Introduction, different reductive processes.

4.1 Catalytic hydrogenation: Homogenious and heterogeneous catalytic reductions. Dissolving metal reductions including Brich reduction.

4.2 Non-metallic reductions: Wolff-Kishner and diimide reductions, Hantzsch ester.

4.3 Metal hydride reductions: Nucleophilic metal hydrides, Sodium cyno borohydride $LiAlH_4$.

4.4 Electrophilic metal hydrides: BH_3 and AlH_3.

4.5 Hydrogenolysis: Use of tri-n-butyl tin hydride.

Books Suggested

1. Designing Organic Synthesis – S. Warren, Willey
2. Some Modern Methods of Organic Synthesis, W.Carrathers, Cambridege Univ.Press
3. Modern syntetic reactions, H.O.House, W.A.Benjamin
4. Advanced Organic Reactions, Reactions, Mechanisms and Structure, J.March, Wiley
5. Principles of Organic Synthesis, R.O.C. Norman and J.M.Coxon, Blackie Academic and Professional
6. Advanced Organic Chemistry Part-B,F.A.Carey and R.J.Sundberg, Plenum P.
7. Organic Reaction and Their mechanisms, P.S.Kalsi, New Age International Publishers
8. Protective Groups in Organic Synthesis, T.W.Greene and P.G.M. Wuts. II nd Edition, John Wiley and Sons 1991
9. Organic synthesis : The Disconnection Approach, sturant Warren, John Wiley and sons.

M. Sc. Second Year, Semester-III
Paper–XVIII; CH-534/2A
Medicinal Chemistry- I

Credits: 04 **Periods: 60**

MC-1: Concepts of Medicinal Chemistry, Classification and Nomenclature of Drugs.
MC-2: Drug Design:
MC-3: Pharmacokinetics and Pharamodynamics.
MC-4: Drug metabolism.
MC-5: Antimicobacterial drugs.
MC-6: Antibiotics
MC-7: Coagulant and Anticoagulant.

MC-1: Concepts of Medicinal Chemistry, Classification and Nomenclature of Drugs. **06P**

A) **Concepts of Medicinal chemistry**: Important terminology in medicinal chemistry: Drugs, Pharmacy, Pharmaceutics, Toxicology; Pharmacodynamic agents, Pharmacophore, Pharmacodynamics, metabolite and antimetabolites, chemotherapy. Mechanism of chemotherapeutic actions: 1) Biological defences 2) Chemical defences. a) Surface active agent, b) Metabolic antagonism. Assay of Drugs: Chemical assay, Biological assay, Immunological assay, LD-50 and ED-50.

B) **Classification and Nomenclature of Drugs:**
i) Classification of drugs on the basis of therapeutic action.
a) Chemotherapeutic agents, b) Pharamacodynamic agents.
ii) Nomenclature of drugs: Naming of drugs according to IUPAC system
a) Naming of organic groups, b) Naming of heterocyclic nuclei.
iii) Differentiate medicine and drugs.

MC-2: Drug Design: **18P**

A] **Drug Discovery.**
i) Introduction
ii) Procedure followed in drug design.
a) Drug discovery without a lead, b) Lead discovery.
iii) Lead modification: Drug design and development
a) Identification of the active part: The pharamcophore, b) Functional group modification, c) Structure-activity relationship, d) Structure modification to increase potency and the therapeutic index; 1) Homologation, 2) Chain branching, 3) Ring-chain transformation., 4) Bioisosterism, 5) Combinatorial chemistry.
iv) Structural modification to increase oral bioactivity.
1) Electronic effect, 2) The Hammet equation, 3) Lipophilicity effect.

B] **Concept of prodrugs and soft drugs.**
a) Prodrugs: i) Prodrugs designing, types of prodrugs, ii) Prodrug formation of compounds containing various chemical groups, Prodrugs and drug delivery system
b) Soft drugs: i) Soft drug concept, ii) Properties of soft drug.

C] Theories of drug activity.

i) Occupancy theory, ii) Rate theory, iii) Induced theory.

D] QSAR method:

Introduction, Methods used in QSAR studies, Hansch method, Free-Wilson method, Advantages and disadvantages of free approach, Computer based methods of QSAR related to receptor binding, Physico-Chemical properties, Lipophilicity, Electronic parameters, Steric substituent constants, Experimental determination of partition coefficients.

E] Structure based drug design.

i) Process of structure based drug design, ii) Deactivation of certain drug,
iii) Determination of the structure of the protein, iv) Design of inhibitors.

F] Molecular modelling using computers.

i) Introduction

ii) Uses of molecular modelling: a) Manual use, b) Further-computer programming, c) X-ray crystallography.

G] Design of Enzyme inhibitors.

i) Introduction, ii) Competitive inhibitors, iii) Active-site directed irreversible inhibition of enzymes, iv) Suicide enzyme inactivation.

H] New developments Gene therapy and drug resistance.

MC-3: Pharmacokinetics and Pharamodynamics. 09P

A] Pharmacokinetics:

a) Drug absorption, b) Distribution, c) Elimination., d) Disposition

B] Pharmacodynamics.

a) Introduction, Elementary treatment of enzyme inhibition, b) Membrane active drug, c) Sulphonamides

Mechanism of action of following drugs:

Action of CNS disorder, inflammation, cardiac dysfunction.

MC-4: Drug metabolism. 05P

I] Introduction, II] Oxidation, III] Reduction, IV] Hydrolysis, V] Conjugation.

MC-5: Antimicobacterial drugs. 08P

A] Antitubercular drugs: Introduction.

a) First-line agents (Primary tubercular drugs): Structure and activity of streptomycin and dihydro-streptomycin, Synthesis and SAR of 4-amino salicylic acid and isoniazid.
b) Second line agents (Secondary antitubercular agents): Structure and activity of Rifampicin, Cycloserine, Viomycin, Enthionamide, Ethambutol, Thioacetazone. (Synthesis of Cycloserine and Ethambutol expected)

B] Antileprotic drugs.

Chaulmoogra and hydnocarpus oil, Multidrug therapy, SAR of sulphones, Dapsone (DDS), Acedapsone, Solapsone, Diaminodipheyl thiourea, Rifampicin. (Synthesis of Acedapsone expected)

MC-6: Antibiotics. 08P

1. Introduction, classification of antibiotics, 2. Cell wall synthesis, 3. Mechanism of action of antibiotics, a) Inhibition of cell-wall synthesis, b) Inhibition of bacterial protein synthesis, c) Disorganization of the cytoplasmic membrane, d) Interference in the bacterial nucleic acid synthesis, e) Inhibition of the tetrahydro-folate biosynthesis

I) Cell wall synthesis inhibitors (β-Lactam antibiotics): Synthesis of Penicillin-V, Penicillin-G, amoxicillin, ampicilin from 6-APA, cephalexin, Structure and activity of benzyl penicillin, semi-synthetic penicillin, cephalosporin, Mode of action of penicillin and cephalosporin.

II) Protein synthesis inhibitors: Structure activity of tetracycline and synthesis of chlortetracycline, Synthesis and SAR of chloramphenicol, Mode of action of chloroamphenicol.

MC-7: Coagulant and Anticoagulant. 06P

Mechanism of blood clotting, Coagulant, Vitamin-K, Vitamin-K analogues, anticoagulant, Action of anticoagulant, Heparin, Coumarin derivatives, Synthesis of 4-hydroxy coumarin, Dicoumarol, Structure activity coumarin derivatives.

Suggested Books:

1. Medicinal chemistry-William O. Foye
2. T. B. of Organic medicinal and pharmaceutical chemistry-Wilson and Gisvold's (Ed. Robert F. Dorge)
3. An introduction to medicinal chemistry-Graham L. Patrick
4. Principles of medicinal chemistry (Vol. I and II)-S. S. Kadam, K. R. Mahadik and K. G. Bothara (Nirali prakashan)
5. Medicinal chemistry (Vol. I and II)-Burger
6. An introduction to drug design-S. S. Pandeya and J. R. Dimmock (New age international)
7. The organic chemistry of drug design and drug action-R. B. Silverman (Academic Press)
8. Strategies for organic drug synthesis and design-D. Lednicer Wiley
9. Pharmacological basis of therapeutics-Goodman and Gilman's (McGraw Hill)

M. Sc. Second Year, Semester-III
Paper–XVIII; CH-534/2B
Polymer Chemistry – I

Credits: 04 **Periods: 60**

PC-1: Basics
PC-2: Polymer characterization
PC-3: Structure and properties
PC-4: Polymer processing

PC-1: Basics **12P**

Important of polymers, Basic concepts; Monomers, repeat units, degree of polymerization. Linear, branched and network polymers. Classification of polymers. Polymerization: Condensation, addition, radical chain, ionic and co-ordination, and co-polymerization, Polymerization conditions and polymer reactions. Polymerization in homogenous and heterogeneous systems.

PC-2: Polymer characterization **16P**

Polydispersion – average molecular weight concept, Weight, and viscosity average molecular weights. Polydispersity and molecular weight distribution. The practical significance of molecular weight. Measurement of molecular weights. End group, viscosity, light scattering, osmotic and ultracentrifugation methods. Analysis and testing of polymers – chemical analysis of polymers, spectroscopic methods, X-ray diffraction study. Microscopy, Thermal analysis and Physical testing, tensile strength. Fatigue, impact, Tear resistance. Hardness and abrassion resistance.

PC-3: Structure and properties **16P**

Morphology and order in crystalline polymers configurations of polymer chains. Crystal structures of polymers. Morphology of crystalline polymers. Strain-induced morphology, crystallization and melting. Polymer structure and physical properties – crystalline melting point Tm – melting points of homogenous series, effect of chain flexibility and other steric factors, entropy and heat of fusion. The glass transition temperature. Tg; Relationship between Tm and Tg, effects of molecular weight, diluents, chemical structure, chain topology, branching and cross-linking, property requirements and polymer utilization

PC-4: Polymer processing **16P**

Plastics: elastomers and fibres, compounding. Processing techniques: Calendering, die-casting, rotational casting, film casting, injection moulding, blow moulding, extrusion moulding, thermo forming, foaming, reinforcing and fibre spinning.

Books suggested:

1. Text book of Polymer science ; F.w.Billmeyer J.Willey
2. Polymer science, V.R.Gowarikar, N.V.Vishwanathan and J. Sreedhar.
3. Principles of Polymerization, George Odian III.Ed.
4. Organic Polymer Chemistry, K.J.Saunders
5. Polymer Chemistry, Golding
6. Principles of Polymer Chemistry, Flory
7. Physical Chemistry of Macromolecules, D.D.Deshpande,
8. Functional monomers and polymers, K.Takemoto, V.Inaki and R.M.Ottanbrite
9. Contemporary polymer chemistry, H.R.alkock and F.W.Lambe, Prentice Hall
10. Physics and Chemistry of polymers, J.M.G.Cowie, Blackie Academic and Professional

M. Sc. Second Year, Semester-IV
Paper-XX; CH-541/2
Advanced Heterocyclic Chemistry

Credits: 04 **Periods: 60**

HC-1: Introduction to Heterocycles
HC-2: Nonaromatic heterocycles
HC-3: Five and six-membered heterocycles with two hetero atoms
HC-4: Heterocycles with more than two hetero atoms.
HC-5: Larger ring and other heterocycles
HC-6: Banzanellated azoles and dipolar structures.

HC-1: Introduction to Heterocycles: 06P

Nomenclature (Hantzsch Widman System), spectral characteristics, reactivity and aromaticity of monocyclic, fused and bridged heterocycles.

HC-2: Nonaromatic heterocycles: 10P

Different types of strains, interactions and conformational aspects on nonaromatic heterocycles. Synthesis, reactivity, and importance of the following ring systems. Azirines, Oxaranes, Thiiranes, Diazirenes, Diaziridines, Azetidines.

HC-3: Five and six-membered heterocycles with two hetero atoms: 10P

Synthesis, reactivity, aromatic character and importance of the following heterocycles: Pyrazole, Imidazole, Oxazole, Thiazole, Pyrimidine, Pyrazine, Oxazine, and Thiazine.

HC-4: Heterocycles with more than two hetero atoms: 10P

Synthesis, reactivity, aromatic character and importance of the following heterocycles: Triazoles, Oxadiazoles, Thiadiazoles, Triazines.

HC-5: Larger ring and other heterocycles: 12P

Synthesis and reactivity of Azepines, Oxepines and Thiepines. Synthesis and rearrangement of Diazepines. Synthesis of Benzoazepines, Benzodiazepines, Benzooxepines, Benzothiepines, Azocines, and Azonines.

HC-6: Banzanellated azoles and dipolar structures: 12P

Banzanellated azoles: Synthesis and reactivity of Benzimidazoles, Benzoxazoles and Benzothiazoles. Heterocyles with Ring-Junction nitrogen: Synthesis and reactivity of Quinolizines, Indolizines and Imidazopyridines. Heterocycles with Dipolar structures: Betaines: Formation, aromaticity and reactivity of pyridine-N-oxides and pyridinium imides. Mesoionic heterocycles: Synthesis and aromaticity of sydnones and 1,3-dipolar addition reaction of mesoionic heterocycles.

Recommended books :

1. Heterocyclic Chemistry, T. L. Gilchrist.
2. An Introduction to the Chemistry of Heterocyclic compounds, R. M. Acheson.
3. Heterocylic chemistry, J. A. Joule & K. Mills.
4. Principals of Modern Heterocyclic Chemistry, A. Paquette.
5. Heterocyclic Chemistry, J. A. Joule & Smith.
6. Handbook of Heterocyclic Chemistry, A. R. Katritzky.

M. Sc. Second Year, Semester-IV
Paper-XXI; CH-542/2
Bio-Organic and Green Chemistry

Credits: 04 **Periods: 60**

BOGC-1: Enzyme Chemistry.
BOGC-2: Nucleic acids.
BOGC-3: Heterocycles.
BOGC-4: Introduction to Green Chemistry.
BOGC-5: Microwave induced and ultrasound assisted green synthesis.
BOGC-6: Ionic liquids as green solvents and use of biocatalysis.

BOGC-1: Enzyme chemistry **15P**

a] 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. Baker's yeast catalyzed reactions, Applications of enzymes in food and drug chemistry

b] Mechanism of Enzyme Action: Transition-state theory, orientation and steric effect, acid-base catalysis, covalent catalysis, strain or distortion. Example of some typical enzyme mechanisms for chymotrypsin, ribonuclease, lysozyme and carboxypeptidase A.

c] 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.

BOGC-2: Nucleic acids. **10P**

Introduction, hydrolysis of nucleic acids, Structure physical and chemical properties of the heterocyclic bases-adenine, guanine. Cytosine, Uracil and Thiamine. Structure and synthesis of nucleosides and nucleotides.

Deoxyribose nucleic acid (DNA): Primary, secondary, tertiary structure of

DNA.Structure of RNA. Types of RNA-mRNA, rRNA and tRNA. Purines and pyrimidine bases of nucleic acids and their preparation.

Lipids: Fatty acids, essential fatty acids, structures and functions of triglycerols, glycerophospho lipids, spingolipids, lipoproteins, composition and function, role in atherosclerosis

BOGC-3 Heterocycles **15P**

A] Azoles: Structural and chemical properties; Synthesis of pyrazole, isothiazole and isoxazole; Synthesis of imidazoles, thiazoles and oxazoles; Nucleophilic and electrophilic substitutions; Ring cleavages.

B] Benzofused heterocycles: Synthesis of indole, benzofuran and benzo-thiophene, quinoline and isoquinoline Nucleophilic, electrophilic and radical substitutions; Addition reactions; Indole rings in biology.

C] Diazines: Structural and chemical properties; Synthesis of pyridazines, pyrimidines, pyrazines; Nucleophilic and electrophilic substitutions.

BOGC-4: Introduction to Green Chemistry. **10P**

Introduction, Need for Green Chemistry, Principles, Concept of atom economy and scope. Atom economy in addition, substitution,elimination and rearrangement

reactions. Inception to green chemistry.Introduction to alternative approaches. Green Chemistry in Pharmaceuticals, pesticides, polymers, computer chips etc.

Solvent free reactions-principle, scope, utility of solvent free conditions, controlling solvent free reactions. Phase changes, optimum reaction temperatures, miscibility of reactants and catalysts.

Basic principles of green synthesis. Different approaches to green synthesis-

A) use of green reagents in green synthesis-dimethyl carbonate, polymer supported reagents- peracids, chromic acids.

B) Green catalysts: Acid catalysts, oxidation catalysts, basic catalysts. Aplications of zeolites.

C) Phase transfer catalyst in green synthesis: Aliquat 336, benzyltrimethyl ammonium Chloride (TMBA), Tetra-n-butyl ammonium chloride.

D) Advantages of PTC reactions to green synthesis. Applications of PTC's in Calkylation, n-alkylation, s-alkylation, darzens reaction, Williamsons synthesis and wittig reaction.

BOGC-5: Microwave induced and ultrasound assisted green synthesis. 05P

Introduction to synthetic organic transformations under microwave.

a) Microwave assisted reactions in water: Hoffmann elimination, hydrolysis, oxidation, saponification reactions.

b) Microwave assisted reactions in organic solvents: Esterification reactions, Fries rearrengment, Orthoester Claisen rearrangement, Diels-Alder reaction, decarboxylation.

c) Microwave solvent free reactions (Solid state reactions): Deacetylation, deprotaction, saponification of ester, alkylation of reactive methylene compounds, synthesis of nitriles from aldehydes, reductions.

d) Ultrasound assited reactions: Introduction, substitution reactions, addition, oxidation, reduction reactions.

BOGC-6: Ionic liquids as green solvents and use of biocatalysis. 05P

a) Ionic liquids as green solvents-green solvents, reactions in acidic ionic liquids and in neutral ionic liquids (Hydrogenation, Diels-Alder reaction, O-alkylation and Nalkylation).

b) Biocatalysts in organic synthesis: Introduction, i) Biochemical Oxidation and reduction (microbial)-production of fine chemicals, vitamins and amino acids. Ii) by microorganisms-production of penicillins,streptomycin and chloremphenicol.

Books Suggested:

1. Natural products: Chemistry and Biological significance, J.Mann, R.S.Davidson, J.B.Hobbs, D.V., Banthropde & J. B. Harborne, Longm, an, Essex.
2. Organic Chemistry, vol-2, I. L. Finar, ELBS.
3. Stereoselective Synthesis: A practical Approach, M. Nogrudi, VCH.
4. Organic Synthesis in water, Paul A. Grieco Blackie.
5. Green Chemistry, theory and practice, Paul T. Anastas and John C. Warner.
6. New Trends in Green chemistry, V. K. Ahluwalia and M. Kidwai.
7. Organic Synthesis: Special techniques, V. K. Ahluwalia and Renu Aggarwal
8. Bioorganic Chemistry: A Chemical Approach to Enzyme Action, Hermann Dugas and C. Penny, Springer-Verlag
9. Enzyme Chemistry: Impact and Applications, Ed. Collin J. Suckling, Chapman and Hall
10. Enzyme Structure and Mechanism, A. Fersht, W. H. Freeman
11. Heterocyclic chemistry by Joule and Mills.
12. Modern Heterocyclic chemistry by L. A. Paquette, Benjamin.
13. Advanced organic chemistry by – Carry and Sundberg
14. Mechanism and structure in organic chemistry by – E. S. Gould, Holt, Rinehart and Winston.

M. Sc. Second Year, Semester-IV
Paper- XXII, CH-543/2
Organic Synthesis- II

Credits: 04 **Periods: 60**

OS-1: Organic Reagents:
OS-2: Reterosynthetic Analysis-I:
OS-3: Reterosynthetic Analysis-II:
OS-4: Designing Organic Synthesis:

OS-1: Organic reagents: 18P

1.1 Organo metallic Reagents.

Principle, preparation, properties and applications of the following in organic synthesis with mechanistic details: Gilman's Reagent (Lithium Dimethyl cuprate), Organocerium Reagents, Organochromium Reagents, Organosilicon Reagents.

1.2 Organo nonmetallic Reagents.

Principle, preparation, properties and applications of the following in organic synthesis with mechanistic details: Lithium Diisoproplamide, Trimethylsilyl iodide, Diazomethane, Polyphosphoric acid, Dicyclohexylcarbodiimide, Lead Tetra-acetate , Borane.

OS-2: Reterosynthetic Analysis-I: 14P

2.1 Disconnection Approach: An introduction to synthons and synthetic equivalents, donar and acceptor synthons, disconnection, steps in planning the synthesis, alternaring polarity dissconnection, functional group interconversions, the importance of the order of events in organic synthesis, chemoselectivity, regioselectivity, Umpolung concept.

2.2 The concept of protecting functional groups and synthesis.

Protection of Amino, Hydroxy, Diol, Carbonyl group of aldehydes and ketones, double and triple bonds

OS-3: Reterosynthetic Analysis-II: 14P

3.1 One group C-X and two group C-X disconnection

3.2 One group Carbon-Carbon Disconnections: Alcohols, and Carbonyl compounds, Alkene synthesis, use of acetylene and aliphatic nitro compounds in organic synthesis.

3.3 Two Group carbon-carbon Disconnections: Diels-Alder reaction 1,3-functionalised compounds, α β unsaturated carbonyl compounds, Control of relative stereochemistry, Control of enatioselectivity control in carbonyl condensations, 1-5 disfunctionalised compounds, Michael addition and Robinson annulations.

OS-4: Designing Organic Synthesis: 14P

4.1 Rearrengement in synthesis.

4.2 Use of ketene in Synthesis.

4.3 Aromatic heterocycles five member rings.

4.4 Synthesis of five and six member rings.

4.5 Synthesis of complex molecules: Camphor, reserpine and vitamin D_2.

Books Suggested

1. Designing Organic Synthesis – S.Warren.
2. Some Modern Methods of Organic Synthesis, W. Carrathers.
3. Modern syntetic reactions, H.O.House, W.A.Benjamin
4. Advanced Organic Reactions, Reactions, Mechanisms and Structure, J. March.
5. Principles of Organic Synthesis, R.O.C. Norman and J.M.Coxon, Blackie Academic and Professional
6. Advanced Organic Chemistry Part-B, F. A. Carey and R. J. Sundberg.
7. Organic Reaction and Their mechanisms, P. S. Kalsi.
8. Protective Groups in Organic Synthesis, T.W.Greene and P.G.M. Wuts. II nd Edition, John Wiley and Sons 1991.
9. Organic Synthesis: The Disconnection Approach, Sturant Warren.
10. Organic Chemistry By Nantz.
11. Organic Chemistry By Clayden.

M. Sc. Second Year, Semester-IV
Paper XXIII, CH-544/2A
Medicinal Chemistry- II

Credits: 04 **Periods: 60**

MC-1: Anti-cancer and Anti-AIDS agents.
MC-2: A: Insulin and Hypoglycemic agents.
MC-3: Antimalarials.
MC-4: Analgesic and Anti-inflammatory drugs:
MC-5: Drugs acting on CNS:
MC-6: Intellectual property right (IPR):

MC-1: Anti-cancer and Anti-AIDS agents. **10P**

A] **Anti-cancer Agents (Anti-neoplastic agents)**:Introduction, Cancer or tumor, Types of tumor, Terminology: Neoplasma, Sarcoma, Carcinoma, Blastoma, Cancers of blood, Metastases. Mechanism of tumor formation, Treatment of cancer: a) Surgery, b) Photo radiation, c) Radation therapy, d) Immunology, e) Chemotherapy. Role of alkylating agents and antimetabolites in the treatment of cancer, i) Alkylating agents, Mustard gas, nitrogen mustards (General methods of preparations), Mechloethamine, melphalan (synthesis) and chlorambucil (synthesis), ii) Antimetabolites, Synthesis and structure activity of 6-mercaptopurine, 5-flurouracil. Brief discussion regarding use of hormones, natural products and antibiotics. Information regarding carcinogenic organic compounds.

B] **Anti-AIDS agents:**
Introduction, structure and life cycle of the AIDS virus, recent development, Taxol and Azedothymidine (AZT) derivatives.

MC-2: A: Insulin and Hypoglycemic agents. **10P**

Introduction, Types of diabetics, Insulin and its preparation, Storage, secretion, and function of insulin, SAR and mechanism action of Sulphonyl urea and Biguanides, Sweeting agents: Saccharin and p-Phenyl urea (Dulcin), (Synthesis of sodium saccharin expected).

B] **Cardiac drugs:**
Introduction, Mycocardial cell, Molecular basis of mycocardial contraction, cardiovascular diseases, pathophsiology heart failure. i) Cardiotonic (Cardiac glycosides): Structure and activity of glycosides, ii) Antianginal drugs. Types of angina pectoris, Mechanism of action of antianginal drugs. Classification of antianginal drugs, a) Nitrates and nitrites, b) Non-nitrate. SAR of Diperidamol, Khellin, Xanthines and Papavarine, iii) Antiarrhythmic drugs: Synthesis and SAR of guanidine, procainamide, iv) β-Adrenergic blocking agents: Synthesis and SAR of propranolol and isoproterenol, v) Calcium channel blockers: Structure activity of 1,4-dihydropyridines, synthesis of Verapamil and Diltiazem, vi) Antihypertensive drug: Primary and secondary hypertension agents like Rauwolfia alkaloids, Synthesis and structure activity of methyldopa, Clonidine, Hydralazin

MC-3: Antimalarials. **08P**

-Introduction, life cycle of plasmodia, chemotherapy of malaria, types of antimalarial drugs. SAR of 8-aminoquinoline derivatives, 4-aminoquinoline derivatives, pyrimidine and biguanide derivatives. Synthesis of pamaquine, primaquine, santoquine, camaquine, and pyrimethamine and choroquine phosphate (expected).

MC-4: A] Analgesic and Anti-inflammatory drugs: 10P

I) Analgesics:

i) Derivatives of Aniline: Synthesis of antifebrin, exalgin and Eupharin

ii) Quinoline derivatives: SAR of cinchophen, morphine and related compounds.

iii) SAR of piperidine, meperidin, methadone, and 6, 7-benzomorphans

iv) Synthesis of mepiridine, methadone and 6, 7-benzomorphans (expected)

II) Anti-inflammatory drugs:

-Introduction, classification on non-steroidal anti-inflammatory drugs, SAR of methyl salicylate, aspirin, iodomethazone, mefenamic acid, phenyl butazone, oxyphenbutazone, Synthesis of ibuprofen and phenylbutazone.

III) Treatment of Gout:

-Introduction, synthesis and uses of Allopurinol.

B] Antifungal agents.

-Introduction, synthesis of Econazole and Fluconazole.

MC-5: Drugs acting on CNS: 12P

A) Anaesthetics:

i) General anaesthetics: Synthesis of methohexital, structure activity of divinyl ether, nitrous oxide, Pentothal.

ii) Local anaesthetics: Introduction, development of local anaesthetics, classification (according to chemical structure), a) Cocaine and its analogues, b) Procaine and related amino benzoic acid, c) Stovain and its analogues, d) Lidocaine and its analogues, e) Synthesis and SAR of cocaine, procaine, lidocaine and stovaine

B) Depressants:

-Introduction

i) Sedative and hypnotics, SAR of aldehydes, ketones and sulphones

ii) Anticonvulsant: Introduction, Structure and activity of substituent barbiturates. Synthesis of Phenobarbital sodium (expected), Hydantoins: General synthesis and SAR of hydantoins.

C) Antipsychotic agents (Neuroleptic agents): Selective modifier of CNS (Tranquillizers)

Introduction, Classification

i) Phenothiazine and thioxanthene derivatives: SAR of promazine, chloropromazine and related compounds.

Synthesis of chlorpromazine and chlorprothixene (expected)

ii) Butyrophenones derivatives: Synthesis of haloperidol, spiroperidol.

SAR of butyrophenones derivatives

iii) Central nervous system stimulants (Antidepressants): Introduction

Tricyclic system with central seven membered ring: Dibenzepine and related compounds, SAR of dibenzepine derivatives

Synthesis of imipramine, amitriptyline, Chloropromazine and Diazepam.

MC-6: A) Intellectual property right (IPR): 10P

Manual of patent practices and procedure, Introduction, Patentable subject matter, Application for patents, Patent application under PCT, Publication and examination of application.

B) Agents for organ imagine OR Diagnostic agents.

Introduction, Classification, Radiopagues agents (contrast media), Water soluble and Water insoluble contrast media. Synthesis of Metrizamide, Iopanoic acid and Pyropylidone. Diognostic chemicals: i) Drugs used to test kidney functions, ii) Drugs

used to test liver functions, iii) Agents used to test gastric function, iv) Agents used to test cardiac function, v) Miscellaneous diagnostic chemicals.

C) Drug acting on Gastrointestinal tract (Drug acting on GIT).

Introduction

a) Gastric antacid: i) Treatment of gastric hyperacidity, ii) H_2-receptor antagonists-Synthesis of Ranitidine (Zantac) and Famotidine. b) Ulcerative colitis.

c) Antispansmodics agents (Spasmolytic agents), d) Anthelmintic agents: Introduction, anthelmintic agents, synthesis of mebendazole.

Suggested Books:

1. Medicinal chemistry-William O. Foye
2. T. B. of Organic medicinal and pharmaceutical chemistry-Wilson and Gisvold's (Ed. Robert F. Dorge)
3. An introduction to medicinal chemistry-Graham L. Patrick
4. Principles of medicinal chemistry (Vol. I and II)-S. S. Kadam, K. R. Mahadik and K. G. Bothara (Nirali prakashan)
5. Medicinal chemistry (Vol. I and II)-Burger
6. An introduction to drug design-S. S. Pandeya and J. R. Dimmock (New age international)
7. The organic chemistry of drug design and drug action-R. B. Silverman (Academic Press)
8. Strategies for organic drug synthesis and design-D. Lednicer Wiley
9. Pharmacological basis of therapeutics-Goodman and Gilman's (McGraw Hill)
10. Manual of patent practice and procedure-Patent office, India (2005)

M. Sc. Second Year, Semester-IV
Paper-XXIII, CH-544/2B
Polymer Chemistry – II

Credits: 04 **Periods: 60**

PC-1: Properties of commercial polymers
PC-2: Polymer Additives
PC-3: Natural polymers
PC-4: Polymer supported reagents in organic chemistry
PC-5: Polymer Degradation and Stabilization

PC-1: Properties of commercial polymers **14P**

Polyethylene, polyvinyl chloride, polyamides, polyesters, phenolic resins, epoxy resins and silicone polymers. Functional polymers – Fire retarding polymers and electrically conducting polymers, Bio-medical polymers – contact lens, dental polymers, artificial heart, kidney, skin and blood cells

PC-2: Polymer Additives **10P**

Role of additives in polymers, Fillers, plasticizers, anti-oxidants and stabilizers, Flame-retardants, colourants.

PC-3: Natural polymers **12P**

Cellulose: Cellulose nitrate, cellulose acetate. viscose rayon, starch, silk, Rubber and modified rubber.

PC-4: Polymer supported reagents in organic chemistry **12P**

Preparation and application of polymer supported catalysts, acids, bases, phase transfer catalysts, transition metal complexes etc. Polymer supported reagents and polymer supported protecting groups including "Solid Phase" peptide synthesis.

PC-5: Polymer Degradation and Stabilization **12P**

Types of degradation – Physical and chemical degradation.
Types of Physical degradation
a. Thermal degradation b. Photodegradation and stabilization
c. Mechanical degradation.
Types of Chemical degradation
a. Solvolytic degradation b. hydrolytical degradation
c. Oxidative degradation and stabilization d. biodegradation.

Books Suggested:

1. Text book of Polymer science ; F.w.Billmeyer J.Willey
2. Polymer science, V.R.Gowarikar, N.V.Vishwanathan and J.Sreedhar, Wiley Eastern
3. Principles of Polymerization, George Odian III.Ed.
4. Organic Polymer Chemistry, K.J.Saunders
5. Polymer Chemistry, Golding
6. Principles of Polymer Chemistry, Flory
7. Physical Chemistry of Macromolecules, D.D.Deshpande, Vishal Publications,1985
8. Functional monomers and polymers, K.Takemoto, V.Inaki and R.M.Ottanbrite
9. Contemporary polymer chemistry, H.R.alkock and F.W.Lambe, Prentice Hall
10. Physics and Chemistry of polymers, J.M.G.Cowie, Blackie Academic andProfessional

M. Sc. Second Year
Laboratory Course-V, Paper– XXV, CH-501
Mixture Analysis

Credits: 04 **Periods: 132**

Qualitative Analysis (At least 10 Organic Mixtures):

Semi-micro Qualitative Analysis of Ternary Mixtures (Solids; Two Solids and One Liquid, One Solid and Two Liquids) containing single/poly functional compounds by Chemical and Physical Method with Chromatographic Separation (TLC) for purity of all three components and its Expected Theoritical Spectral Data (IR, ^{1}H NMR & ^{13}C NMR).

M. Sc. Second Year
Laboratory Course-VI, Paper– XXVI, CH-502
Synthesis of Organic Molecules

Credits: 04 **Periods: 132**

1. Multistage Synthesis (At least four)

a) Benzophenone → benzopinacol → benzopinacolone

b) Benzoin → benzil → benzilic acid

c) Benzaldehyde → chalcone → chalcone epoxide,

d) Acetanalide → 4-bromoacetanalide → 4-bromo-2-chloroacetanalide → 2-chloro-4-bromoaniline.

e) Cyclohexanone → cyclohexanone oxime → caprolactone

f) Anthranilic acid → o-chlorobenzoic acid → N-phenyl Anthranilic acid → acridone

2. Synthesis of Drug Molecules (At least Four)

a) Synthesis of anaesthetic drug Benzocaine.

b) Synthesis of anticancer drug 6-methyl uracil.

c) Synthesis of antibacterial drug sulfanilamide.

d) Synthesis of anti-epileptic drug antypyrine.

e) Synthesis of anti-convulsant drug Phenytoin.

3. Use of ultrasound and microwaves in organic synthesis. (One Each)

a) Ultrasound-assisted one-pot synthesis of 2,4,5-triarylimidazole catalyzed by ceric (IV) ammonium nitrate in aqueous media from benzaldehyde, benzil/benzoin and ammonium acetate. (Chinese Chemical Letter, 20 (3), 283-287, 2009).
b) Synthesis of Benzotriazoles by Ultrasound Irradiation from o-phenylenediamine. (Letters in Organic Chemistry, 2007, 4, 43-46).
c) The Hantzch dihydropyridine synthesis from aldehydes, ethyl acetoacetate and urea in microwave irradiation. (Synthetic Letters, 8, 1296-1298, 2001; Synthetic Communications, 31, 425-430, 2001)
d) Synthesis of coumarin by Knoevenagel synthesis using salicyladehyde, ethyl acetate in presence of base in microwave irradiation. (J. Chem. Res. (S), 468-469, 1998).
e) Synthesis of dihydropyrimidones from Biginelli Reaction by acid-catalyzed, three-component reaction between an aldehyde, ß-ketoester and urea *(Tetrahedron, **2005**, 61, 4275-4280).*

Note:

1. Synthesis is carried out in molar quantities (Less than 5 gm).
2. Reaction with possible mechanism.
3. Calculate Theoritical and practical % yield.
4. Product conformation by Physical constant and TLC.
5. Give expected spectral data (IR and NMR) of starting material, intermediate and final product.
6. All the prepared organic compounds should be stored as a sample and present at the time of University examination.

M. Sc. Second Year
Laboratory Course-VII, Paper– XXVII, CH-503
Physico-Organic Estimations

Credits: 04 **Periods: 132**

A] Estimation of Drugs by Titrimetry: (At least three)

a) Assay of Aspirin.
b) Assay of Ibuprofen.
c) Assay of Analgin.
d) Determination of Chloride in Ringer Lactate solution for Injection.
e) Determination of Calcium ions in Calcium Gluconate Injection.

B] Isolation of natural products. (At least three)

a) Isolation of caffeine from tea leaves.
b) Isolation of piperine from black pepper
c) Isolation of β-carotene from carrots
d) Isolation of lycopene from tomatoes
e) Isolation of limonene from lemon peel
f) Isolation of euginol from cloves

C] Estimation of Drugs by Instrumental Methods: (At least Four)

a) Assay of sulfanilamide by Potentiometry.
b) Assay of Riboflavin by Colorimetry.
c) Assay of ascorbic acid by Colorimetry.
d) Assay of Diazepam by UV-Vis Spectrophotometer.
e) Assay of Riboflavin by UV-Vis Spectrophotometer.
f) Estimation of carbohydrates, amino acids, proteins by UV-Vis spectrophotometer.
g) Determination of Hammett constants and determine its substitution effect.
i) Benzoic acid, ii) P-Nitro Benzoic acid, iii) P-Methoxy Benzoic acid, iv) P-Methyl benzoic acid, v) P-Chloro benzoic acid.
(Out of two compounds one compound must be benzoic acid and another should be substituted benzioc acid is given to the students)

Note:

1. All required solutions must be prepared by the students.
2. In examination one experiment is on Instrumental and one should be on non-instrumental.

Books Referred:

1. Moden Experimental organic chemistry by Royston M.Robert, John C.Gilbert, Lyuu B.Rodewald & alan S.Wingrove, Saunder International Edition
2. Advanced practical organic chemistry by N.K.Vishnoi
3. Experimental organic chemistry by L. M. Harwood & C. I. Moody, Blackwell Scientific Publications.
4. The systematic identification os organic compounds by R.L.Shriner & D.Y.Curtin
5. Semi-microqualitative organic analysis by N.D.Cheronis, J.B.Entrikin & E.M.Wodnett
6. small scale organic preparation by P.J.Hill
7. Vogel's textbook of practical organic chemistry by ELBS, Longmann.

M. Sc. Second Year
Laboratory Course-VIII, Paper– XXVIII, CH-504
Project

Credits: 04 (Project: 75 + Seminar 25) **Periods: 132**

Literature Survey, Studies of Reactions, Synthesis, Mechanism, Isolation of Natural Products, Standardization of Reaction Conditions, New Synthetic Methods etc.

Note:

1. External and Internal Examiners will examine this project jointly at the time of Practical examination.
2. The stuents will have to give at least one seminar in each semester in their subject of specilisation is compulsory.
3. Project work must be carried out only in specialized branch.
4. All synthesized organic compounds should be submitted at the time of University Examination.
5. The project work carried out during the year shold be presented in power point presentation in presence of University Examiners.

CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER PATTERN
Post Graduate (PG) Programme in Chemistry
(Affiliated Colleges)
w. e. f. Academic year 2015-16
Question paper Model
(For all papers)

Mark: 75 Time: 3 hrs

Q 1. Solve any three out of five. Marks – 15
(a)
(b)
(c)
(d)
(e)

Q 2. Attempt any three out of five. Marks – 15
(a)
(b)
(c)
(d)
(e)

Q 3. Solve. (A)
OR (A) Marks – 08
(B)
OR (B) Marks – 07

Q 4. Solve. (A)
OR (A) Marks – 08
(B)
OR (B) Marks – 07

Q 5. (A) Select the correct alternative from the following – Marks - 5
(B) Write short notes on any two – Marks - 10
(a)
(b)
(c)