

UNIVERSITY OF MUMBAI

**TIME TABLE OF POST-GRADUATES FOR THE M.Sc. [SEM III] STUDENTS IN ORGANIC CHEMISTRY AT ZONE I AND II
DIVISION FOR THE YEAR 2017-18. [D.G. Ruparel college]**

Lectures will commence from : - 19th June 2017

Coordinator: Dr. R.V. Rele (Ruparel college)

Semester III

| Sr. No. | Name of the professor | Days and dates | Paper and topic/unit |
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| 01 | Dr. K.T. Waghmode (Ruparel college) | Monday June: 19, July: 3,10,17,24,31 August : 7, 2.30 to 4.30 p.m. | Unit 1: Organic reaction mechanisms [15L] 1.1 Organic reactive intermediates, methods of generation, structure, stability and important reactions involving carbocations, nitrenes, carbenes, arynes and ketenes. [5L] 1.2 Neighbouring group participation: Mechanism and effects of anchimeric assistance, NGP by unshared/ lone pair electrons, π -electrons, aromatic rings, σ -bonds with special reference to bornyl and norbornyl systems (formation of non-classical carbocation) [3L] 1.3 Role of FMOs in organic reactivity: Reactions involving hard and soft electrophiles and nucleophiles, ambident nucleophiles, ambident electrophiles, the α effect. [2L] 1.4 Pericyclic reactions: Classification of pericyclic reactions; thermal and photochemical reactions. Three approaches: Conservation of orbital symmetry - Correlation diagram, Frontier molecular orbital approach [FMO] and Aromatic transition state approach [Huckel and Mobius]. [5L] |
| 02 | To be announced later | Monday 4.30 to 6.30 p.m. June: 19, July: 3,10,17,24,31 August : 7, ----- | PSCHO303 (Paper III) [15] Unit 4: Advanced spectroscopic techniques-I [15L] 4.1 IR spectroscopy: Application in structure elucidation. Principle and applications of FT-IR. [2L] 4.2 NMR spectroscopy: Application in structure elucidation. Relaxation phenomenon and relaxation time. First order, second order and higher order spectra. Methods of simplification of complex spectra. Double resonance, NOE, NOE difference spectroscopy and chemical shift reagents. Spin system notations, AB, AX, AB ₂ -AX ₂ , AMX and A ₂ B ₂ -A ₂ X ₂ spin systems with suitable examples. Coupling in aromatic and heteroaromatic systems, long range coupling. Spectra of diastereotopic systems. FT-NMR spectroscopy: Pulse sequences, pulse widths, spins and magnetization vectors. [7L] 4.3 ¹⁹ F- NMR and ³¹ P- NMR spectroscopy: Principles and applications. [2L] 4.4 Problems based on combined use of IR and PMR spectroscopic techniques. [4L] |
| 03 | Prof. Borate (Kirti college) | Monday August :14,21, Sept:4,11,18,25 | PSCHO301(Paper I) [15] Unit 4: Photochemistry 4.1 Principles of photochemistry: quantum yield, electronic states and transitions, |

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| | | Oct:9. 2.30 to 4.00 p.m. | <p>selection rules, modes of dissipation of energy (Jablonski diagram), electronic energy transfer: photosensitization and quenching process. [3L]</p> <p>4.2 Photochemistry of carbonyl compounds: $\pi \rightarrow \pi^*$, $n \rightarrow \pi^*$ transitions, Norrish-I and Norrish-II cleavages, Paterno-Buchi reaction. Photoreduction, calculation of quantum yield, photochemistry of enones, photochemical rearrangements of α, β-unsaturated ketones and cyclohexadienones. Photo Fries rearrangement, Barton reaction. [8L]</p> <p>4.3 Photochemistry of olefins: cis-trans isomerizations, dimerizations, hydrogen abstraction, addition and Di-π-methane rearrangement including aza-di-π-methane. [2L]</p> <p>4.4 Photochemistry of arenes: 1, 2-, 1, 3- and 1, 4- additions. [1L]</p> <p>4.5 Singlet oxygen and photooxygenation reactions. [1L]</p> |
| 04 | Dr. K.J. Chavan (Ruparel college) | Monday 4.30 to 6.00 p.m. August :8,22,29 September:19,26 Oct:3,10. | <p>PSCHO 301 (Paper I) [15]</p> <p>Unit 3: Stereochemistry-I [15L]</p> <p>3.1 Classification of point groups based on symmetry elements with examples (non-mathematical treatment). [2L]</p> <p>3.2 Conformational analysis of medium rings: Eight and ten membered rings and their unusual properties, I-strain, transannular reactions.[2L]</p> <p>3.3 Stereochemistry of fused ring and bridged ring compounds: decalins, hydrindanes, steroids, and Bredt's rule. [4L]</p> <p>3.4 Dynamic stereochemistry: Selection of substrate, Curtin-Hammett principle, Effect of conformation on reactivity of cyclohexane derivatives in the following reactions (including mechanism): electrophilic addition, nucleophilic substitution, elimination, molecular rearrangements, reduction of cyclohexanones and oxidation of cyclohexanols. [7L]</p> |
| 05 | Dr.(Mrs.) S. Dasgupta (Jai Hind college) | Tuesday June : 20,27 July: 4,11,18,25 Aug: 1 2.30 to 4.30 p.m. | <p>Unit 1: Name reactions with mechanism and application [15L]</p> <p>1.1 Mukaiyama esterification, Mitsunobu reaction, Baylis Hillman reaction, Suzuki coupling, Wacker process, Heck reaction, Sonogashira reaction. [7L]</p> <p>1.2 Multicomponent reactions: Strecker synthesis, Hantzsch pyridine synthesis, Biginelli synthesis, Multicomponent reactions using alkyl isocyanides: Passerini and Ugi-4-component synthesis.[6L]</p> <p>1.3 Domino/cascade reactions: Introduction with one example. [2L]</p> |
| 06 | Dr. (Mrs.) R.N. Joshi (National college) | Tuesday June : 20,27 July: 4,11,18,25 Aug: 1 4.30 to 6.00 p.m. | <p>Unit 1: Heterocyclic compounds-I [08L]</p> <p>1.1 Heterocyclic compounds: Introduction, classification, common, systematic (Hantzsch-Widman) and replacement nomenclature of monocyclic (3-6 membered) and bicyclic (5-6 Membered) fused heterocycles (up to three hetero atoms). [5L]</p> |

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| | | | 1.2 Small ring heterocycles (3-4 membered): Introduction, nucleophilic ring opening reactions of oxiranes, aziridines, oxetanes and azetidines. [3L] |
| 07 | Prof. (Mrs.) Gomathi Shridhar (Menon College, Bhandup) | Tuesday Aug: 8,22,.. Sept: 12,19,26, Oct:3,10 2.30 to 4.30 p.m | Unit 2: Protection-deprotection, umpolung and electro-organic chemistry [15L] 2.1 Protection and deprotection of the following functional groups: hydroxyl, carbonyl, amino and carboxyl with applications. 2.2 Concept of umpolung, generation of acyl anion equivalent using 1,3- dithianes, methyl thiomethyl sulfoxides, cyanide ions, cyanohydrin ethers, nitro compounds and vinylated ethers. |
| 08 | Dr. (Mrs.) Chitra Kamath (Somaiya college) | Wednesday June: 21,28 July : 5,12,19,26 Aug: 2, 2.30 to 4.30 p.m.. | Unit 2: Pericyclic reactions [15L] 2.1 Cycloaddition reactions: $4n\pi$ and $(4n+2)\pi$ electron systems. Diels-Alder reactions, 1, 3-Dipolar cycloaddition and cheletropic reactions, ene reaction, retro-Diels-Alder reaction, regioselectivity, periselectivity, site selectivity and effect of substituents in Diels-Alder reactions. [7L] 2.2 Electrocyclic reactions: Conrotatory and disrotatory motions, $4n\pi$ and $(4n+2)\pi$ electron systems. [3L] 2.3 Sigmatropic rearrangements: H-shifts and C-shifts, supra and antarafacial migrations, retention and inversion of configurations. Cope (including oxy-Cope and aza-Cope) and Claisen rearrangements. Formation of Vitamin D from 7-dehydrocholesterol, synthesis of citral using pericyclic reaction [5L] |
| 09 | Prof. Uttam Yadav Bhavan's college | Wednesday Aug: 9,16,23, 2.30 to 4.30 p.m. | 2.3 Electro-organic chemistry: Introduction, electrode potential, cell parameters, electrolyte, working electrode, choice of solvents, supporting electrolytes. Cathodic reductions of alkyl halides, aldehydes, ketones, nitro compounds, olefins, arenes; electro-dimerizations. Anodic oxidation: Kolbe type reactions, oxidation of alkylbenzenes. [5L] |
| 10 | Prof. Shailesh Vajekar (C.K.T. college) | Wednesday June: 22,29 July : 13,20,27 Aug: 3,10 4.30 to 6.00 p.m. | Unit 3: Enamines and ylides [15L] 3.1 Methods of preparation of enamines: condensation of secondary amine and aldehyde or ketone, reaction between alkynes and secondary amines. Comparison of reactivity of enamines and enolates. Synthetic reactions of enamines including asymmetric reactions of chiral enamines derived from chiral secondary amines. [3L] 3.2 Phosphorus, sulfur and nitrogen ylides: Preparation, structure and comparison of reactivity. Reactions of phosphorus, sulfur and nitrogen ylides with carbonyl compounds, including mechanism and stereochemistry. Wittig reaction, Wittig-Horner reaction. [6L] 3.3 α C-H activation by nitro, sulfoxide, sulfone and phosphonate groups: generation of carbanions by strong bases (LDA/n-butyl lithium) and applications in C-C bond formation. Bamford-Stevens Reaction, Julia olefination and its modification, Bestmann-Ohira Reagent, Barton-Kellogg olefination, Steven's rearrangement. [6L] |

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| 11 | Prof. B.k. N. Singh (Jai-Hind college) | Thursday June : 22,29, July: 6,13,20,27 Aug: 3 2.30 to 4.30 p.m. | <p>Unit 4: Metals / Nonmetals in organic synthesis [15 L]</p> <p>4.1 Mercury in organic synthesis: oxymercuration and demercuration of alkenes, mechanism and regiochemistry, solvomercuration, mercuration of aromatics and transformation of aryl-mercurials to aryl halides. [2L]</p> <p>4.2 Organoboron compounds: applications of organo-boranes, generation of diboranes, hydroboration of alkenes and alkynes: mechanism, regiochemistry, stereochemistry, asymmetric hydroboration using chiral boron reagents and functional group reduction by diborane. [3L]</p> <p>4.3 Organosilicons: Important features of silicon governing the reactivity of C-Si compounds: preparation and important bond forming reactions of alkyl silanes, alkenyl silanes, aryl silanes and allyl silanes. β-silyl cations as intermediates.[3L]</p> <p>4.4 Silyl enol ethers as enolate precursors, iodotrimethylsilane in organic synthesis. [2L]</p> <p>4.5 Organotin compounds: preparation of alkenyl and allyl tin compounds and their applications in C-C bond formation. [3L]</p> <p>4.6 Selenium in organic synthesis: Preparation of selenols/selenoxide, selenoxide elimination to create unsaturation, selenoxide and seleno acetals as α- C-H activating groups. [2L]</p> |
| 12. | Dr. (Ms.) Tanuja Parulekar (S.I.W.S. college) | Thursday June : 22,29, July: 6,13,20,27 Aug: 3 4.30 to 6.00 p.m. | <p>2.3 Insect pheromones: General structural features and importance. Synthesis of bombykol from acetylene, disparlure from 6-methylhept-1-ene, grandisol from 2-methyl-1,3-butadiene. [3L]</p> <p>3.3 Insect growth regulators: General idea, structures of JH_2 and JH_3. [1L]</p> <p>3.4 Plant growth regulators: Structural features and applications of arylacetic acids, gibberelic acids and triacontanol. Synthesis of triacontanol (synthesis of stearyl magnesium bromide and 12-bromo-1-tetrahydropyranyloxydodecane expected). [2L]</p> <p>Unit 2: Biomolecules-I [15L]</p> <p>2.1 Amino acids, peptides and proteins: Chemical and enzymatic hydrolysis of proteins to peptides, amino acid sequencing. Secondary structure of proteins, forces responsible for holding of secondary structures, α- helix, β-sheets, super secondary structure.Tertiary structure of protein: folding and domain structure. Quaternary structure. [4L]</p> <p>2.2 Nucleic acids: Structure and function of physiologically important nucleotides (c-AMP, ADP, ATP) and nucleic acids (DNA and RNA), replication, genetic code, protein biosynthesis, mutation. [6L]</p> <p>2.3 Chemical synthesis of oligonucleotides: Phosphodiester, Phosphotriester, Phosphoramidite and H- phosphonate methods including solid phase approach. [5L]</p> |

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| 13. | Prof. S.A. Vanmali (Ruia college) | Friday June : 23,30 July:7,14,21,28 Aug: 4 2.30 to 4.30 p.m. | Unit 4: Biogenesis and biosynthesis of natural products [15L] 4.1 Biogenesis: Precursors, primary and secondary metabolites. Acetate hypothesis. [7L] Mevalonate and Shikimic acid pathways. 4.2 General principles involved in the biosynthesis of amino acids, alkaloids, steroids and terpenoids. [3L] 4.3 Biosynthesis of selected natural products: L-tryptophan, cholesterol, ephedrine, citronellol. [5L] |
| 14. | (To be announced) | Friday Aug: 11,18, Sept: 1,8 2.30 to 4.30 p.m. | 1.3 Reactivity and important methods of synthesis and general reactions of the following heterocycles: pyrazoles, imidazoles, oxazoles, isoxazoles, thiazoles, benzimidazoles, benzoxazoles, benzothiazoles. [7L] |
| 15 | Dr. A.S. Uzgare (Wilson college) | Friday 4.30 to 6.00 p.m. June : 23,30 July:7,14,21,28 Aug: 4, 11,18, Sept: 1,8,15,22,29 | Unit 3: Natural products- II [10L][PSCHO 303] 3.1 Multi-step synthesis of natural products: Synthesis of the following natural products with special reference to reagents used, stereochemistry and functional group transformations: a) Woodward synthesis of Reserpine from benzoquinone b) Corey synthesis of Longifolene from resorcinol c) Gilbert-Stork synthesis of Griseofulvin from phloroglucinol d) E. Wenkert's synthesis of β -vetivone from acetone e) A.V.Ramarao synthesis of 4-demethoxydaunomycin from ethyl acetoacetate.[9L] Unit 3: Biomolecules-II [15L] PSCH0304 3.1 Chemistry of enzymes: Introduction, nomenclature, classes and general types of reactions catalyzed by enzymes. Properties of enzymes: i) Enzyme efficiency/catalytic power ii) Enzyme specificity; Fischer's 'lock and key' and Koshland 'induced fit' hypothesis. Concept and identification of active site. [6L] 3.2 Factors affecting enzyme kinetics: Substrate concentration, enzyme concentration, temperature, pH, product concentration etc. Reversible and irreversible inhibition. [4L] 3.3 Mechanism of enzyme action: transition-state theory, orientation and steric effect, acid-base catalysis, covalent catalysis, strain or distortion. Mechanism of chymotrypsin catalyzed hydrolysis of a peptide bond. [5L] |
| 15 | Dr. A.S. Uzgare (Wilson college) | Saturday June: 24 July; 1,8,15,22,29 Aug: 5,12 2.30 to 4.30 p.m. | Unit 3: Biomolecules-II [15L] 3.1 Chemistry of enzymes: Introduction, nomenclature, classes and general types of reactions catalyzed by enzymes. Properties of enzymes: i) Enzyme efficiency/catalytic power ii) Enzyme specificity; Fischer's 'lock and key' and Koshland 'induced fit' hypothesis. Concept and identification of active site. [6L] 3.2 Factors affecting enzyme kinetics: Substrate concentration, enzyme concentration, temperature, pH, product concentration etc. Reversible and irreversible inhibition. [4L] |

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| | | | <p>3.3 Mechanism of enzyme action: transition-state theory, orientation and steric effect, acid-base catalysis, covalent catalysis, strain or distortion. Mechanism of chymotrypsin catalyzed hydrolysis of a peptide bond. [5L]</p> |
| 16 | (To be announced later) | <p>Saturday 4.30 to 6.30 p.m. June: 24 July: 1,8,15,22,29 Aug: 5,12</p> | <p>Unit 2: Natural products-I [15L]</p> <p>2.1 Carbohydrates: Introduction to naturally occurring sugars: Deoxysugars, aminosugars, branched sugars. Structure elucidation of lactose, D-glucosamine and mesoinositol (synthesis not expected). Structural features and applications of inositol, starch, cellulose, chitin and heparin. [5L]</p> <p>2.2 Natural pigments: General structural features, occurrence, biological importance and applications of: carotenoids, anthocyanins, quinones, flavones, pterins and porphyrins (chlorophyll). Structure elucidation of β-carotene. Synthesis of ubiquinone from 3,4,5-trimethoxyacetophenone. [5L]</p> <p>2.4 Alkaloids: Occurrence and physiological importance of morphine, coniine and papaverine. [2L] Structure elucidation of papaverine.</p> <p>3.2 Prostaglandins: Classification, general structure and biological importance. Structure elucidation of PGE₁ and PGF_{1α} (synthesis not expected). [3L]</p> |
| 117 | (To be announced later) | | <p>Unit 1: Drug discovery, design & development [15L]</p> <p>1.1 Introduction, Important terms used in medicinal chemistry: receptor, therapeutic index, bioavailability, drug assay and drug potency. General idea of factors affecting bioactivity: Resonance, inductive effect, bioisosterism, spatial considerations. Basic pharmacokinetics: drug absorption, distribution, metabolism (biotransformation) and elimination. Physical and chemical parameters like solubility, lipophilicity, ionization, pH, redox potential, H-bonding, partition coefficient and isomerism in drug distribution and drug-receptor binding. [7L]</p> <p>1.2 Procedures in drug design: Drug discovery without a lead: Penicillin, Librium. Lead discovery: random screening, non-random (or targeted) screening. Lead modification: Identification of the pharmacophore, Functional group modification, Structure-activity relationship, Structure modification to increase potency and therapeutic index: Homologation, chain branching, ring-chain transformation, bioisosterism, combinatorial synthesis (basic idea). [8L]</p> |

M. Sc. (SEM. III) ORGANIC CHEMISTRY (2017-2018)

NOTE : Attention of post-graduate students M.Sc. (Sem.III) is invited to the following :-

1. That they will be required to attend in each of the terms, not less than 75% of the total number of lectures delivered & also not less than 75% of the lectures delivered in each paper;
2. In addition to attendance at lectures, they will be required to carry out regular work assigned to them in the form of essays, problems, tutorials, practical etc. as prescribed and shall be required to maintain a record thereof in a properly bound journals. The work carried out by the student shall be reviewed by the respective teachers at the end of two terms. In case, in the opinion of the Head of University Department or the Principals of the recognized Post-graduate Institutions concerned, the candidate has not satisfactorily carried out the assigned work as mentioned above, they may not grant term to the student, even though he/she might have kept the minimum attendance at the lectures.

Mumbai-400 032.
21st June, 2017.

P.S. Dhurman
Assistant Registrar
UG/PG Section

P.S. Teacher participating in the scheme of Post-graduate teaching and Instruction for course in the subject of Organic Chemistry are hereby requested to submit the attendance rolls in respect of the lectures delivered by them during the academic year 2017-2018 within 15 days after completion of their lectures in the respective terms are over to the Superintendent, Post-graduate studies Section, Room No. 130, University of Mumbai, Fort, Mumbai-32.

N.B. Teacher participating in the scheme of post-graduate teaching and Instruction at the M. Sc. degree course in Organic Chemistry are hereby informed that no change will be permitted in the venue and timings of the lectures.

No.PG/2/ICD/2017-18/ 665 of 2017.

21st June, 2017.

Copy forwarded with compliments to the teachers of the University included in the scheme of post-graduate teaching and instruction at the M. Sc. degree in Organic Chemistry for information and necessary action.

Mumbai-400 032.
21st June, 2017.

P.S. Dhurman
Assistant Registrar
UG/PG Section
19/6/17