Time-table of post-graduate lectures for the M.Sc. (PART-II) Semester III in Organic Chemistry at Thane division for the year 2019-20

Dr. V. B. Patil (Coordinator Thane Zone)

Sr. No.	Name of Teacher	Days &Date	Topics	Lect.
1	Dr. Tanaji Bansode 2.00pm-5.00pm CHM college	Mondays July 1,8,15,22,29 Aug. 5,19,26 Sept. 9,16	**Course Code: PSCHO301** **Paper - I (Theoretical organic chemistry-I) Unit 2Pericyclic reactions [15L]** 2.1 Cycloaddition reactions: Supra and antra facial additions, 4n and 4n+2 systems, 2+2 additions of ketenes. Diels-Alder reactions, 1, 3-Dipolar cycloaddition and cheletropic reactions, ene reaction, retro-Diels-Alder reaction,regioselectivity, periselectivity, torquoselectivity, site selectivity and effect of substituents in Diels-Alder reactions. Other Cycloaddition Reactions- [4+6] Cycloadditions, KeteneCycloaddition, Allene Cycloadditions, Carbene Cycloaddition, Epoxidation and Related Cycloadditions. Other Pericyclic reactions: Sigmatropic Rearrangements, Electrocyclic Reactions, Alder 'Ene' Reactions. [7L] 2.2 Electrocyclic reactions: Conrotatory and disrotatary motions, 4np and (4n+2)p electron and allyl 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, conversion of Endiandric acid E to Endiandric acid A. [5L] **Course Code: PSCHO302 Paper-II Synthetic Organic Chemistry-I** **Unit 2:Radicals in organic synthesis[15L]** 2.1 Introduction: Generation, stability, reactivity and structural and stereochemical properties of free radicals. Persistent and charged radicals,Electrophilic and nucleophilic radicals.[3L] 2.2 Radical Initiators:azobisisobutyronitrile (AIBN)&dibenzoyl peroxide.[1L] 2.3 Characteristic reactions - Free radical substitution, addition to multiplebonds. Radical cham reactions. Radical halogenation of	**30L**

			hydrocarbons(Regioselectivity),radical cyclizations, autoxidations: synthesis of cumenehydroperoxide from cumene.[4L] 2.4 Radicals in synthesis: Inter and intra molecular C-C bond formation via mercuric hydride, tin hydride, thiol donors. Cleavage of C-X, C-Sn, C-Co, C-S, O-O bonds. Oxidative coupling, C-C bond formation in aromatics SRNAr reactions.[4L] 2.5 Hunsdiecker reaction, Pinacol coupling, McMurry coupling, Sandmeyer reaction, Acyloin condensation.[3L]	
2	Dr. D.N.Shinde 5.00pm-6.00pm 4.00pm-5.00pm CHM College	Mondays July 1,8,15,22,29 Aug. 5,19,26 Sept. 9,16 Tuesdays July 2,9,16,23,30	**Course Code: PSCHO301 Paper - I (Theoretical organic chemistry-I) Unit 4 Photochemistry [15L]** 4.1 Principles of photochemistry: quantum yield, electronic states and transitions, selection rules, modes of dissipation of energy (Jablonskidiagram), electronic energy transfer: photosensitization and quenching process.[3L] 4.2 Photochemistry of carbonyl compounds:p..p*, n..p* transitions.Norrish- I and Norrish-II cleavages, Paterno-Buchi reaction.Photoreduction, calculation of quantum yield, photochemistry of enones, photochemical rearrangements of a, ß-unsaturated ketones and cyclohexadienones. Photo Fries rearrangement, Barton reaction.[8L] 4.3 Photochemistry of olefins: cis-trans isomerizations, dimerizations, hydrogenabstraction, addition and Di- p- methane rearrangement including aza-di- p-methane. Photochemical Cross-Coupling of Alkenes, Photodimerisation ofalkenes.[2L] 4.4 Photochemistry of arenes: 1, 2- , 1, 3- and 1. 4- additions. Photocycloadditions of aromatic Rings.[1L] 4.5 Singlet oxygen and photo-oxygenation reactions. Photochemically induced Radical Reactions. Chemiluminescence.[1L]	**15L**
3	Dr. Nagesh Sutar 1pm-4pm	Tuesdays July 2,9,16,23,30 Aug. 6,13,20,27 Sept. 17	**Course Code: PSCHO301 Paper - I (Theoretical organic chemistry-I) Unit 3:Stereochemistry-I[15L]** 3.1 Classification of point groups based on symmetry elements with examples (nonmathematical treatment)[2L] 3.2 Conformational analysis of medium rings: Eight to ten membered rings and their unusual properties, I-strain, transannular reactions.[3L]	**30L**

	C.H.M. College		3.3 Stereochemistry of fused ring and bridged ring compounds: decalins, hydrindanes, perhydroanthracenes, steroids, and Bredt's rule.[5L] 3.4 Anancomeric systems, Effect of conformation on reactivity of cyclohexane derivatives in the following reactions (including mechanism): electrophilicaddition, elimination, molecular rearrangements, reduction ofcyclohexanones (with LiAlH4, selectride and MPV reduction) and oxidation of cyclohexanols.[5L] **Course Code: PSCHO303 Natural products and Spectroscopy** 2.1 Multi-step synthesis of natural products: Synthesis of the following natural products with special reference to reagents used, stereochemistry and functional group transformations:[8L] a) Woodward synthesis of Reserpine from benzoquinone b) Corey synthesis of Longifoline from resorcinol c) Gilbert-Stork synthesis of Griseofulvin from phloroglucinol d) Corey's Synthesis of Caryophyllene from 2-Cyclohexenone and Isobutylene e) Synthesis of Juvabione from Limonene f) Synthesis of Taxol. 2.2 Prostaglandins: Classification, general structure and biological importance. Structure elucidation of PGE1.[2L] 2.3 Lipids: Classification, role of lipids, Fatty acids and glycerol derived fromoils and fats.[2L] 2.4 Insect growth regulators: General idea, structures of JH2 and JH3.[1L] 2.5 Plant growth regulators: Structural features and applications of arylaceticacids, gibberellic acids and triacontanol. Synthesis of triacontanol (synthesisof stearyl magnesium bromide and 12-bromo-1-tetrahydropyranyloxydodecane expected).[2L]	
4	Dr.Sandeep Kotwal 2pm-5pm	Wednesday July 3,10,17,24,31 Aug. 7,14,21,28 Sept. 11	**Course Code: PSCHO302 Synthetic Organic Chemistry-I** **Unit 1:Name reactions with mechanism & application[15L]** 1.1 Mukaiyama esterification, Mitsonobu reaction, Darzen's Glycidic Ester syntheis, Ritter reaction, Yamaguchi esterification, Peterson olefination.[5L] 1.2 Domino reactions: Characteristics: Nazerov cyclization[3L] 1.3 Multicomponent reactions: Strecker Synthesis, Ugi 4CC, Biginelli synthesis, Hantzsch synthesis, Pictet-Spengler synthesis[5L]	**30L**

			1.4ClickReactions:Characteristics;Huisgen1,3-DipolarCycloaddition[2L] **Unit 3:Enamines, Ylides and a-C-H functionalization[15]—Dr.S.B.Kotwal** 3.1 Enamines: Generation & application in organic synthesis with mechanistic pathways, Stork enamine reaction. Reactivity, comparison between enamines and enolates. Synthetic reactions of enamines including asymmetric reactions of chiral enamines derived from chiral secondary amines.[4L] 3.2 Phosphorus, Sulfur and Nitrogen Ylides: Preparation and their synthetic applications along with their stereochemical aspects. Wittig reaction, Horner-Wadsworth-Emmons Reaction, Barton-Kellogg olefination.[6L] 3.3 a-C-H functionalization: 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, Seyferth–Gilbert homologation, Steven's rearrangement.[5L]	
5	Dr. Sandeep Kotwal 4pm-5pm 5pm-6pm CHM College	Tuesdays Aug. 6,13,20,27 Sept. 17 Wednesday July 3,10,17,24,31 Aug. 7,14,21,28 Sept. 11	**Course Code: PSCHO302 Synthetic Organic Chemistry-I** **Unit 4:Metals / Non-metals in organic synthesis[15]—Dr.S.B.Kotwal** 4.1 Mercury in organic synthesis: Mechanism and regiochemistry of oxymercuration and demercuration of alkenes, mercuration of aromatics, transformation of aryl mercurials to aryl halides. Organomercurials as carbene transfer reagents.[3L] 4.2 Organoboron compounds: Mechanism and regiochemistry of hydroboration of alkenes and alkynes, asymmetric hydroboration using chiral boron reagents, 9-BBN hydroboration, oxazaborolidine (CBS catalyst) and functional group reduction by diborane.[3L] 4.3 Organosilicons: Salient features of silicon governing the reactivity of organosilicons, preparation and important bond-forming reactions of alkyl silanes, alkenyl silanes, aryl silanes and allyl silanes. ß-silyl cations asintermediates. Iodotrimethylsilane in organic synthesis[3L] 4.4 Silyl enol ethers: Application: As nucleophiles (Michael reaction, Mukaiyama aldol reaction), in ring contraction reactions.[2L]	**15L**

			4.5 Organotin compounds: Preparation of alkenyl and allyl tin compounds; application in C-C bond formation, in replacement of halogen by H at the same C atom.[2L] 4.6 Selenium in organic synthesis: Preparation of selenols/selenoxide, selenoxide elimination to create unsaturation, selenoxide and seleno acetalsas a-C-H activating groups[2L]	
6	Dr. D.N. Shinde 2pm-5pm CHM College	Thursdays July 4,11,18,25 Aug. 1	**Course Code: PSCHO303 Natural products and Spectroscopy** **Unit 1:Natural products-I[15L]** 1.1 Carbohydrates: Introduction to naturally occurring sugars: Deoxysugars, aminosugars, branched sugars. Structure elucidation of lactose and D-glucosamine (synthesis not expected).Structural features and applications ofinositol, starch, cellulose, chitin and heparin.[5L] 1.2 Natural pigments: General structural features, occurrence, biological importance and applications of: carotenoids, anthocyanins, quinones,flavones, pterins and porphyrins (chlorophyll). Structure elucidation of ß-carotene and Cyanin (with synthesis). Synthesis of ubiquinone from 3, 4, 5-trimethoxyacetophenone.[5L] 1.3 Insect pheromones: General structural features and importance. Types of pheromones (aggregation, alarm, releaser, primer, territorial, trail, sex pheromones etc.), advantage of pheromones over conventional pesticides. Synthesis of bombykol from acetylene, disparlure from 6-methylhept-1-ene, grandisol from 2-methyl-1. 3-butadiene.[3L] 1.4 Alkaloids: Occurrence and physiological importance of morphine and atropine. Structure elucidation, spectral data and synthesis of coniine.[2L]	15L
7	Dr. D.N.Shinde 2pm-5pm CHM College	Thursdays Aug. 8,22,29 Sept. 12,19	**Course Code: PSCHOEC-I 304 Medicinal , Biogenesis and green chemistry** **Unit 4:Green chemistry[15L]-----Dr. D.N.Shinde** 4.1 Introduction, basic principles of green chemistry. Designing a green synthesis; Green starting materials, green reagents, green solvents and reaction conditions, green catalysts [1L]	15L

			4.2 Use of the following in green synthesis with suitable examples:[9L] a) Green reagents: dimethylcarbonate, polymer supported reagents. b) Green catalysts: Acid catalysts, oxidation catalysts, basic catalysts, phasetransfer catalysts [Aliquat 336, benzyltrimethyl ammonium chloride (TMBA), Tetra-n-butyl ammonium chloride, crown ethers], biocatalysts. c) Green solvents: water, ionic liquids, deep eutectic solvents, supercriticalcarbon dioxide. d) Solid state reactions: solid phase synthesis, solid supported synthesis e) Microwave assisted synthesis: reactions in water, reactions in organic solvents, solvent free reactions. f) Ultrasound assisted reactions. 4.3 Comparison of traditional processes versus green processes in the syntheses of ibuprofen, adipic acid, 4-aminodiphenylamine, p-bromotoluene and benzimidazole.[3L] 4.4 Green Cataysts : Nanocatalyst, Types of nanoctalysts, Advantages and Disadvantages of Nanocatalysts, Idea of Magnetically separable nanocatalysts.[2L]	
8	**Dr.Manisha Khemani** 5pm-6pm CHM College 2pm-6pm	Thursdays Thursdays July 4,11,18,25 Aug. 1,8,22,29 Sept. 12,19 Fridays July 5,12,19,26 Aug.2,	**Course Code: PSCHO301 Paper - I (Theoretical organic chemistry-I) Unit 1Organic 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, p-electrons, aromatic rings, s-bonds with special reference to norbornyl and icyclo[2.2.2]octylcation 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: Evidence for the concertedness of bond making and breaking Symmetry-Allowed and Symmetry-Forbidden Reactions –	**30L**

			. The Woodward-Hoffmann Rules-Class by Class . The generalised Woodward-Hoffmann Rule Explanations for Woodward-Hoffmann Rules . The Aromatic Transition structures [Huckel and Mobius]. Frontier Orbitals . Correlation Diagrams, FMO and PMO approach Molecular orbital symmetry, Frontier orbital of ethylene, 1,3 butadiene, 1,3,5 hexatriene and allyl system.[5L] **Course Code: PSCHOEC-I 304 Medicinal , Biogenesis and green chemistry** **Unit 3: Biogenesis and biosynthesis of natural products[15L]** 3.1 Primary and secondary metabolites and the building blocks, general pathway of amino acid biosynthesis.[3L] 3.2 Acetate pathway: Biosynthesis of malonylCoA, saturated fatty acids, prostaglandins from arachidonic acid, aromatic polyketides.[4L] 3.3 Shikimic Acid pathway: Biosynthesis of shikimic acid, aromatic amino acids, cinnamic acid and its derivatives, lignin and lignans, benzoic acid and its derivatives, flavonoids and isofalvonoids.[4L] 3.4 Mevalonate pathway: Biosynthesis of mevalonic acid, monoterpenes – geranyl cation and its derivatives, sesquiterpenes – farnesyl cation and its derivatives and diterpenes.[4L]	
9	Dr.D.R. Ambavadekar 2pm-6pm. 2pm-4pm BNB College	Fridays Aug. 9,16,23,30 Sept. 13,20,27 Saturday July 6	**Course Code: PSCHO303 Natural products and Spectroscopy** **Unit 3:Advanced spectroscopic techniques-I[15L]** 3.1 Proton NMR spectroscopy: Recapitulation, chemical and magnetic equivalence of protons, First order, second order. Spin system notations (A2, AB, AX, AB2, AX2, AMX and A2B2-A2X2 spin systems with suitable examples). Long range coupling (Allylic coupling, 'W' coupling and Coupling in aromatic and heteroaromatic systems). Temperature effects, Simplification of complex spectra, nuclear magnetic double resonance, chemical shift reagents.[7L] 3.2 13C –NMR spectroscopy: Recapitulation, equivalent and non-equivalent carbons (examples of aliphatic and aromatic compounds),	**30L**

			13C- chemical shifts, calculation of 13C- chemical shifts of aromatic carbons, heteronuclearcoupling of carbon to 19F and 31P.[4L] 3.3 Spectral problems based on UV, IR, 1HNMR and 13CNMR and Mass spectroscopy.[4L] **Course Code: PSCHOEC-I 304 Medicinal , Biogenesis and green chemistry** **Unit2: Drug design, development and synthesis[15L]** 2.1 Introduction to quantitative structure activity relationship studies. QSARparameters: - steric effects: The Taft and other equations; Methods used tocorrelate regression parameters with biological activity: Hansch analysis- Alinear multiple regression analysis.[5L] 2.2 Introduction to modern methods of drug design and synthesis-computer-aided molecular graphics based drug design, drug design via enzyme inhibition (reversible and irreversible), bioinformatics and drug design.[3L] 2.3 Concept of prodrugs and soft drugs. (a) Prodrugs: Prodrug design, types of prodrugs, functional groups in prodrugs, advantages of prodrug use. (b) Soft drugs: concept and properties.[3L] 2.4 Synthesis and application of the following drugs: Fluoxetine, cetrizine, esomeprazole, fluconazole, zidovudine, methotrexate, diclofenac,labetalol,fenofibrate.[4L]	
10	Dr. Anita Goswami 2pm-6pm 2pm-6pm BNB College	Saturday July 13,20,27 Aug 3,10,24,31 Sept. 14	**Course Code: PSCHO303 Natural products and Spectroscopy** **Unit 4:Advanced spectroscopic techniques-II[15L]** 4.1 Advanced NMR techniques: DEPT experiment, determining number of attached hydrogens Methyl/methylene/methine and quaternary carbons), two dimensional spectroscopic techniques, COSY and HETCOR spectra, NOE and NOESY techniques.[10L] 4.2 Spectral problems based on UV, IR, 1HNMR, 13CNMR (Including 2D technique) and Mass spectroscopy[5L] **Course Code: PSCHOEC-I 304 Medicinal , Biogenesis and green chemistry** **Unit 1: Drug discovery, design and development[15L]** 1.1 Introduction, important terms used in medicinal chemistry: receptor, therapeutic index,bioavailability, drug assay and drug potency. General	**30L**

			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 drugdistribution and drug-receptor binding.[7] 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, combinatiorial synthesis (basic idea).[8L]	

M. Sc. (Part – II) (Semester – III) Organic Chemistry **2019-20**

NOTE: - Attention of the post-graduate students M. Sc. (Part - II) (Semester – III) is invited to the following:

1. That they will be required to attend in each of the term not less than 75% of the total number of lectures delivered and also not less than 75% of the lectures delivered in each paper.
2. That in addition to attendance at lectures, they will be required to carry out regularly the practical work assigned to them in the laboratory and shall be required to maintain a record there of in a properly bound journal. The work carried out by the students shall be reviewed by the respective teachers at the end of two terms. In case in the opinion of the Principal of the affiliated colleges or the Head of department of the recognized post-graduate Institution concerned, students has not done satisfactorily the work assigned to him by the respective teachers it shall be open to the Principals of the colleges or Head of the department of the recognized post-graduate institution concerned not to grant the terms to the student even though he might have kept the minimum attendance at the lectures.

N.B. Teachers 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.

Sd/-
Assistant Registrar,
Post Graduate Studies Section

Mumbai – 400 032.
23rd August. 2019.

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P.S. Teachers participating in the scheme of post-graduate teaching and Instructions in the subject of **Organic Chemistry** are requested to submit the attendance rolls in respect of the lectures delivered by them during the academic year **2019-2020** within 15 days after completion of their lectures in the respective terms are over, to the Coordinator at the respective centre.

No. PG/ICD/2019/ 1181 /of 2019. 23rd August, 2019.

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

P.S. Thumal
Assistant Registrar,
Post Graduate Studies Section

Mumbai – 400 032.
23rd August. 2019.

23/8/19 23/8/19