

Time-table of post-graduate lectures for the M.Sc. (PART-II) Semester III in Organic Chemistry at Thane division for the year 2020-21

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 Aug. 10,17,24 Sept. 7,14,21,28 Oct. 5,12,19	<u>Course Code: PSCHO301</u> <u>Paper - I (Theoretical organic chemistry-I) Unit 2 Pericyclic reactions [15L]</u> 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, Ketene Cycloaddition, 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 disrotatory 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] <u>Course Code: PSCHO302 Paper-II Synthetic Organic Chemistry-I</u> <u>Unit 2: Radicals in organic synthesis [15L]</u> 2.1 Introduction: Generation, stability, reactivity and structural and stereochemical properties of free radicals, Persistent and charged	30L

			radicals, Electrophilic and nucleophilic radicals.[3L] 2.2 Radical Initiators: azobisisobutyronitrile (AIBN) & dibenzoyl peroxide.[1L] 2.3 Characteristic reactions - Free radical substitution, addition to multiple bonds. Radical chain reactions, Radical halogenation of hydrocarbons (Regioselectivity), radical cyclizations, autoxidations: synthesis of cumene hydroperoxide 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. Bhavana Patil 5.00pm-6.00pm 4.00pm-5.00pm CHM College	Mondays Aug. 10, 17, 24 Sept. 7, 14, 21, 28 Oct. 5, 12, 19 Tuesdays Aug. 11, 18, 25 Sept. 1, 8	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 (Jablonski diagram), 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 α, β-unsaturated ketones and cyclohexadienones. Photo Fries rearrangement, Barton reaction.[8L] 4.3 Photochemistry of olefins: cis-trans isomerizations, dimerizations, hydrogen abstraction, addition and Di-p-methane rearrangement including aza-di-p-methane. Photochemical Cross-Coupling of Alkenes, Photodimerisation of alkenes.[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 C.H.M. College	Tuesdays Aug. 11, 18, 25 Sept. 1, 8	<u>Course Code: PSCHO301 Paper - I (Theoretical organic chemistry-I) Unit 3:Stereochemistry-I[15L]</u> 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] 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 LiAlH ₄ , selectride and MPV reduction) and oxidation of cyclohexanols.[5L]	15L
4.	Dr. D. N. Shinde 1pm-4pm C.H.M. College	Tuesdays Sept. 15, 22, 29 Oct. 6, 13	<u>Course Code: PSCHO303 Natural products and Spectroscopy</u> 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 PGE ₁ . [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 JH ₂ and JH ₃ . [1L] 2.5 Plant growth regulators: Structural features and applications of	15L

			arylaceticacids, gibberellic acids and triacontanol. Synthesis of triacontanol (synthesis of stearyl magnesium bromide and 12-bromo-1-tetrahydropyranyloxydodecane expected).[2L]	
5.	Dr. Sandeep Kotwal		Course Code: PSCHO302 Synthetic Organic Chemistry-I Unit 3: Enamines, Ylides and α-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 α-C-H functionalization: By nitro, sulfoxide, sulfone and phosphonate groups: generation of carbanions by strong bases (LDA/ <i>n</i>-butyl lithium) and applications in C-C bond formation. Bamford-Stevens reaction, Julia olefination and its modification, Seyferth-Gilbert homologation, Steven's rearrangement.[5L] 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	30L
	4pm-5pm	Tuesdays		
		Sept. 15,22,29		
		Oct. 6,13,20,27		
		Nov. 3,10, 17		
	2pm-6pm	Wednesday		
		Aug. 12, 19, 26		
	CHM College	Sept. 2,9		

			reactivity of organosilicons, preparation and important bond-forming reactions of alkyl silanes, alkenyl silanes, aryl silanes and allyl silanes. β-silyl cations as intermediates. Iodotrimethylsilane in organic synthesis[3L] 4.4 Silyl enol ethers: Application: As nucleophiles (Michael reaction, Mukaiyama aldol reaction), in ring contraction reactions.[2L] 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 acetals as α-C-H activating groups[2L]	
6.	Mrs. Sarika Talreja 2pm-5pm CHM College	Wednesday Sept. 16, 23, 30 Oct. 7, 14	<u>Course Code: PSCHO302 Synthetic Organic Chemistry-I</u> <u>Unit 1: Name reactions with mechanism & application[15L]</u> 1.1 Mukaiyama esterification, Mitsunobu reaction, Darzen's Glycidic Ester synthesis, Ritter reaction, Yamaguchi esterification, Peterson olefination.[5L] 1.2 Domino reactions: Characteristics; Nazarov cyclization[3L] 1.3 Multicomponent reactions: Strecker Synthesis, Ugi 4CC, Biginelli synthesis, Hantzsch synthesis, Pictet-Spengler synthesis[5L] 1.4 Click Reactions: Characteristics; Huisgen 1,3-Dipolar Cycloaddition[2L]	15L
7.	Mrs. Sarika Talreja 2pm-5pm CHM College	Thursdays Aug. 13, 20, 27 Sept. 3, 10, 17, 24 Oct. 1, 8, 15	<u>Course Code: PSCHO303 Natural products and Spectroscopy</u> <u>Unit 1: Natural products-I[15L]</u> 1.1 Carbohydrates: Introduction to naturally occurring sugars: Deoxy sugars, aminosugars, branched sugars. Structure elucidation of lactose and D-glucosamine (synthesis not expected). Structural features and applications of inositol, 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	15L

			elucidation of β-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]	
			<u>Course Code: PSCHOEC-I 304 Medicinal , Biogenesis and green chemistry</u> <u>Unit 4:Green chemistry[15L]</u> 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] 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	15L

			syntheses of ibuprofen, adipic acid, 4-aminodiphenylamine, p-bromotoluene and benzimidazole.[3L] 4.4 Green Catalysts : Nanocatalyst, Types of nanocatalysts, Advantages and Disadvantages of Nanocatalysts, Idea of Magnetically separable nanocatalysts.[2L]	
8.	<u>Dr.Manisha Khemani</u> 5pm-6pm 2pm-6pm CHM College	Thursdays Aug. 13, 20, 27 Sept. 3, 10, 17, 24 Oct. 1, 8, 15, 22 Fridays Aug. 14	<u>Course Code: PSCHO301 Paper - I (Theoretical organic chemistry-I) Unit 1 Organic reaction mechanisms [15L]</u> 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 bicyclo[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 – 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]	15L
9.	<u>Dr. Sandeep Kotwal</u> 2pm-6pm	Fridays Aug. 21, 28 Sept. 4,	<u>Course Code: PSCHOEC-I 304 Medicinal , Biogenesis and green chemistry</u> <u>Unit 3: Biogenesis and biosynthesis of natural products[15L]</u> 3.1 Primary and secondary metabolites and the building blocks, general pathway of amino acid biosynthesis.[3L]	15L

	2pm to 5pm CHM College	Sept.11	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 isoflavonoids. [4L] 3.4 Mevalonate pathway: Biosynthesis of mevalonic acid, monoterpenes – geranyl cation and its derivatives, sesquiterpenes – farnesyl cation and its derivatives and diterpenes. [4L]	
10.	Dr. Nagesh Sutar 2pm-6pm. 2pm-4pm CHM College	Fridays Sept. 18,25 Oct. 9,16, 23 Saturday Aug. 29 Sept. 5,12,19,26	<u>Course Code: PSCHO303 Natural products and Spectroscopy</u> <u>Unit 3: Advanced spectroscopic techniques-I [15L]</u> 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), ¹³C- chemical shifts, calculation of ¹³C- chemical shifts of aromatic carbons, heteronuclear coupling of carbon to ¹⁹F and ³¹P. [4L] 3.3 Spectral problems based on UV, IR, ¹H NMR and ¹³C NMR and Mass spectroscopy. [4L] <u>Course Code: PSCHOEC-I 304 Medicinal , Biogenesis and green chemistry</u> <u>Unit2: Drug design, development and synthesis [15L]</u> 2.1 Introduction to quantitative structure activity relationship studies. QSAR parameters: - steric effects: The Taft and other equations; Methods used to correlate regression parameters with biological activity: Hansch analysis- A linear multiple regression analysis. [5L] 2.2 Introduction to modern methods of drug design and synthesis- computer-aided molecular graphics based drug design, drug design	30L

			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, cetirizine, esomeprazole, fluconazole, zidovudine, methotrexate, diclofenac, labetalol, fenofibrate.[4L]	
11.	Dr. D.N. Shinde 5pm-6pm 2pm to 4pm CHM College	Saturday Aug. 29 Sept. 5,12,19,26 Oct.3,10,24,31 Nov. 7, 21,28	<u>Course Code: PSCHO303 Natural products and Spectroscopy</u> <u>Unit 4:Advanced spectroscopic techniques-II[15L]</u> 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]	15L
12.	Dr. Sandeep Kotwal 3pm-5pm 4pm-6pm 3pm-4pm CHM College	Saturday Oct. 3,10,24,31 Nov. 7,21,28 Dec. 5	<u>Course Code: PSCHOEC-I 304 Medicinal , Biogenesis and green chemistry</u> <u>Unit 1: Drug discovery, design and development[15L]</u> 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 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,	15L

			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]	
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Instructions:

1. Platform: Google Meet or Zoom
2. Individual teacher will create his/her own meeting link and post in the WhatsApp group of M.Sc. 2020-21
3. Each teacher is required to maintain the attendance record by taking screenshots during the lecture and then making its entry manually/ electronically in the attendance sheet prepared by the individual teacher. The attendance can also be maintained by preparing the Google form and sharing link for the same in meet chat box during the ongoing lecture.

Dr. V. B. PATIL
Coordinator
Thane Zone

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 thereof 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 **Chemistry** are hereby informed that no change will be permitted in the venue and timings of the lectures.

Mumbai – 400 032
08th September, 2020

Sd/-
Offg. Deputy Registrar,
Post Graduate Studies Section

P.S. Teachers participating in the scheme of post-graduate teaching and Instructions in the subject of **Chemistry** are requested to submit the attendance rolls in respect of the lectures delivered by them during the academic year **2020-2021** within 15 days after completion of their lectures in the respective terms are over, to the Coordinator at the respective centre.

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