UNIVERSITY OF MUMBAI

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

Lectures will commence from : - 5th January 2018 **Coordinator: Dr. R.V. Rele (Ruparel college)**

Semester IV

Sr. No.	Name of the professor	Days and dates	Paper and topic/unit
01	**Dr. K.J. Chavan (Ruparel college)**	**Monday 2.30 to 4.30 p.m.** Jan: 22, 29, Feb: 5, 12, 26 Mar: 5, 12	**Paper IV: Unit 4: Green chemistry [15L]** **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: a) Green reagents: dimethylcarbonate, polymer supported reagents. b) Green catalysts: Acid catalysts, oxidation catalysts, basic catalysts, phase transfer catalysts [Aliquat 336, benzyltrimethyl ammonium chloride (TMBA), Tetra-n-butyl ammonium chloride, crown ethers], biocatalysts. c) Green solvents: water, ionic liquids, deep eutectic solvents, supercritical carbon 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. **[10L]** **4.3:** Comparison of traditional processes versus green processes in the syntheses of ibuprofen, adipic acid, 4-aminodiphenylamine, p-bromotoluene and benzimidazole. **[4L]**
02	**Dr. (Mrs.) Pallavi Tiwari (S.I.E.S. College)** .	**Monday 4.30 to 6.00 p.m.** Jan: 22, 29, Feb: 5, 12, 26 Mar: 5, 12	**Paper III: Unit 4: Advanced spectroscopic techniques [15L]** **4.1: ^{13}C –NMR spectroscopy:** Introduction, ^{13}C- chemical shifts, calculation of ^{13}C-chemical shifts, proton coupled ^{13}C - spectra, proton decoupled ^{13}C- spectra. Off-resonance decoupling, DEPT technique, hetero-nuclear coupling of carbon to ^{19}F and ^{31}P. **[4L]** **4.2: Two-dimensional NMR spectroscopy:** Introduction, COSY and HETCOR techniques, (including interpretation of COSY and HETCOR spectra). NOESY and ROESY techniques. . **[4L]** **4.3** : **Problems** based on combined use of spectroscopic techniques/ advanced techniques.

			[3L] **4.4: ESR and Fluorescence spectroscopy:** Principles and applications**.** **[3L]** **4.5:** Applications of NMR in medicine. **[1L]**
03	**Prof. (Mrs.) Gomathi Shridhar** **(Menon college)**	**Tuesday** **2.30 to 4..30 p.m.** Jan: 23, 30, Feb: 6, 20, 27 Mar: 6, 13	**Paper II: Unit 2: Designing organic synthesis [15L]** **2.1:** Methodology in organic synthesis: convergent and divergent synthesis, functional group interconversions, general methods of synthesis of 4 -7 membered rings, disconnection approach and retrosynthetic analysis, idea of synthons and synthetic equivalents . Retrosynthesis of acyclic saturated and unsaturated systems, monocyclic, bicyclic and aromatic compounds. **[11L]** **2.2:** Synthesis of some complex molecules: synthetic routes based on retrosynthetic analysis for following molecules: prostaglandin A_2, atropine and camphor. **[4L]**
04	**Dr. (Mrs.) S. Dasgupta** **(Jai-hind college)**	**Tuesday** **4.30 to 6.00 p.m.** Jan: 23, 30, Feb: 6, 20, 27 Mar: 6, 13	**Paper III: Unit 1: Heterocyclic compounds-II [15L]** Reactivity, important methods of synthesis and general reactions of the following heterocycles: pyridines, pyridine-N-oxide, pyridazines, pyrimidines, pyrazines, s-triazines, quinolines, isoquinolines, indoles, purines, oxazines, coumarins. **[15L]** **[4L]**
05	**Prof. (Mrs.)Indu Shastri** **(National College)**	**Wednesday** **2.30 to 4..30 p.m.** Jan: 24, 31, Feb: 7, 14, 28 Mar: 7, 14 .	**Paper I: Unit 1: Physical organic chemistry [15L]** **1.1** Structural effects and reactivity**:** Linear free energy relationship (LFER) in determination of organic reaction mechanism, The Hammett equation, substituent constants, theories of substituent effects, interpretation of σ-values, reaction constants ρ, Yukawa-Tsuno equation**.** **[7L]** **1.2** Uses of Hammett equation, deviations from Hammett equation. Dual parameter correlations, Inductive substituent constants. The Taft model, σ_I and σ_R scales, steric parameters Es and β. Solvent effects, Okamoto-Brown equation, Swain-Scott equation, Edward and Ritchie correlations, Grunwald-Winstein equation, Dimroth's E_T parameter. **[8L]**
06	**Prof. (Mrs.) Kiran Jathar** **(national college)**	**Wednesday** **4.30 to 6..00 p.m.** Jan: 24, 31, Feb: 7, 14, 28 Mar: 7, 14 .	**Paper I: Unit 3: Stereochemistry- II [15L]** **3.1** Racemisation and resolution: Mechanism of racemisation, methods of resolution: chemical, kinetic and equilibrium asymmetric transformation and through inclusion compounds. **[3L]** **3.2** Determination of enantiomer and diastereomer composition: Isotope dilution method, enzymatic method, chromatographic methods. Methods based on NMR spectroscopy: use c chiral derivatising agents (CDA), chiral solvating agents (CSA) and Lanthanide shift reagen (LSR). **[3L]**

			3.3 Correlative methods for configurational assignment: chemical, optical rotation, quasi-racemate and NMR spectroscopy. **[4L]** **3.4** Molecular dissymmetry and chiroptical properties: Linearly and circularly polarized ligh Circular birefringence and circular dichroism. ORD and CD curves. Cotton effect and its applications. The octant rule and the axial α–haloketone rule with applications. **[5L]**
07	**Prof. B.k. N. Singh** **(jai- hind college)**	**Thursday** **2.30 to 4.30 p.m.** Jan: 25, Feb: 1,8, 15, 22 Mar:1, 8 .	**Paper II: Unit 4: Transition and rare earth metals in organic synthesis [15 L]** **4.1** Introduction, basic concepts, 18 electron rule, bonding in transition metal complexes, oxidative addition, reductive elimination, migratory insertion. **[3L]** **4.2** Palladium in organic synthesis: π-bonding of Pd with olefins, applications in C-C bond formation, carbonylation, alkene isomerisation, cross coupling of organometallics and halides. Catalysis of cycloaddition reactions and heteroatom coupling to produce bonds between aryl/vinyl groups and N, S or P atoms. **[3L]** **4.3** Olefin metathesis using Grubb's catalyst. [**1L]** **4.4** Applications of nickel, cobalt, iron, rhodium and chromium carbonyls in organic synthesis. **[4L]** **4.5** Applications of samarium iodide including reduction of organic halides, aldehydes and ketones, α-functionalised carbonyl compounds and nitro compounds. **[1L]** **4.6** Applications of Cerium (IV) in synthesis of heterocyclic quinoxaline derivatives and its role as a deprotecting agent. **[1L]** **4.7** $Sc(OTf)_3$ and $Yb(OTf)_3$ as water tolerant Lewis acid catalysts in aldol condensation, Michael reaction, Diels-Alder reaction, Friedel-Crafts reaction, oxidation reactions. [**2L]**
08	**Dr. Juliet Miranda**	**Thursday** **4.30 to 6.00 p.m.** Jan: 25, Feb: 1,8, 15, 22 Mar:1, 8	**Paper III : Unit 3: Natural products-IV [15L]** **3.1 Vitamins:** Classification, sources and biological importance of vitamin B_1, B_2, B_6, folic acid, B_{12}, C, D_1, E (α-tocopherol), K_1, K_2, H (β- biotin). Synthesis of the following: Vitamin B_1 including synthesis of pyrimidine and thiazole moieties Vitamin B_2 from 3, 4-dimethylaniline and D(-)ribose Vitamin B_6 from: 1) ethoxyacetylacetone and cyanoacetamide 2) ethyl ester of N-formyl-DL-alanine(Harris synthesis) Vitamin E (α-tocopherol) from trimethylquinol and phytyl bromide Vitamin K_1 from 2-methyl-1, 4-naphthaquinone and phytol. **[7L]** **3.2 Antibiotics:** Classification on the basis of activity. Structure elucidation of penicillin-G and cephalosporin-C. Synthesis of penicillin-G and phenoxymethylpenicillin from D-penicillamine and t-butyl phthalimide malonaldehyde (synthesis of D-penicillamine and t-butyl phthalimide malonaldehyde expected). **[6L]** **3.3 Naturally occurring insecticides:** Sources, structure and biological properties of pyrethrums (pyrethrin I), rotenoids (rotenone), azadirachtin. Synthesis of pyrethrin I.**[2L]**

09	**Dr.S.S. Borde** **(Wilson college)**	**Friday** **2.30 to 4.30 p.m.** Jan:19, Feb: 2,9, 16, 23 Mar:9, 16	**Paper IV: Unit 2: Biomolecules - III [15L]** **2.1** Chemistry of coenzymes. Structure, mechanism of action and bio-modeling studies of the following coenzymes: nicotinamide adenine dinucleotide, flavin adenine dinucleotide, thiamine pyrophosphate, pyridoxal phosphate, Vitamin $B_{12,}$ biotin, lipoic acid, Coenzyme A. **[12L]** **2.2** Oxygen activation in biological systems with reference to cytochromes. **[3L]**
10	**Dr. (Ms.) M. kulkarni** **M.D. College**	**Friday** **4.30 to 6.00 p.m.** Jan:19, Feb: 2,9, 16, 23 Mar:9, 16	**Paper II : Unit 1: Radicals in organic synthesis [15 L]** **1.1** General aspects: Electrophilic and nucleophilic radicals and their reactivity with π-rich/deficient olefins. **[1L]** **1.2** Inter- and intramolecular aliphatic C-C bond formation using tin hydride, carbon hydride, thio donor (Barton's reaction). **[2L]** **1.3** Cleavage of C-X, C-Sn, C-Co and C-S bonds in the generation of radicals. **[3L]** **1.4** Trapping by electron transfer reactions using manganese triacetate. **[1L]** **1.5** Radical –radical processes: oxidative couplings, single electron oxidation of carbanions to generate radicals, dehydrodimerization and reductive couplings. **[3L]** **1.6** C-C bond formation in aromatics: Introduction, electrophilic and nucleophilic radical reactions on aromatics, radical reactions on heteroaromatics: alkylations and acylations **[3L]** **1.7** Hunsdiecker halodecarboxylation, autooxidation **[2L]**
11	**Dr. Suraj Purandare** **(Siddarth college)**	**Monday to Friday** **3.00 to5.30 p.m.** March: 19, 20,21,22,23,24	**Paper I : Unit 4: Asymmetric synthesis [15L]** **4.1** Principles of asymmetric synthesis: Introduction, the chiral pool in Nature, methods of asymmetric induction – substrate, reagent and catalyst controlled reactions**.** **[3L]** **4.2** Synthesis of α-amino acids (Corey's diastereoselective hydrogenation of cyclic hydrazones), synthesis of L-DOPA [Knowles's Mosanto process]. **[1L]** **4.3** Asymmetric reactions with mechanism: Aldol and related reactions including Cram's rule, Sharpless enantioselective epoxidation, hydroxylation, aminohydroxylation, Diels-Alder reaction, reduction of prochiral carbonyl compounds and olefins**.** **[8L]** 4.4 **Use of chiral auxiliaries in diastereoselective reductions, asymmetric amplification . Use of chiral BINOLs, BINAPs and chiral oxazolines and oxazolidines in asymmetric transformations.** [3L]
12	**Dr. Priti Khedkar** **(Khalasa college)**	**Saturday** **2.30 to 4.30 p.m.**	**Paper I : Unit 2: Supramolecular chemistry [15L]** **2.1** Principles of molecular associations and organizations as exemplified in biological

		Jan:20,27 Feb: 3,10, 17, 24 Mar:3,	macromolecules like nucleic acids, proteins and enzymes. **[3L]** **2.2** Synthetic molecular receptors: receptors with molecular cleft, molecular tweezers, receptors with multiple hydrogen sites. **[3L]** **2.3** Structures and properties of crown ethers, cryptands, cyclophanes, calixarenes, rotaxanes and cyclodextrins. Synthesis of crown ethers, cryptands and calixarenes**[6L]** **2.4** Molecular recognition and catalysis, molecular self assembly. **[3L]**
13	**Prof . Karun Sodha** **(K.C. College)**	**Saturday** **4.30 to 6.00 p.m.** Feb: 3,10, 17, 24 Mar:3,	**Paper II: Unit 3: Newer methods in organic synthesis [15L]** **3.1** Basic principles and applications of the following in organic synthesis: Crown ethers, cryptands, micelles, cyclodextrins, clay and zeolites and phase transfer catalysts. **[9L]** **3.2** Introduction to polymer supported reagents and organocatalysts**.** **[3L**] **3.3** Principles and applications of ultrasound and microwaves in organic synthesis**.[3L]**
14.	**(To be announced later)**	**(To be announced later)**	**Paper 3 : Unit 2: Natural products-III [15L]** **2.1 Steroids:** General structure, classification. Occurrence, biological role, important structural and stereochemical features of the following: corticosteroids, steroidal hormones, steroidal alkaloids, sterols and bile acids. **[5L]** **2.2** Synthesis of 16-DPA from cholesterol and plant sapogenin. **[2L]** **2.3** Synthesis of the following from 16-DPA: androsterone, testosterone, oestrone, oestriol, oestradiol and progesterone. **[5L]** **2.4** Synthesis of cinerolone, jasmolone, allethrolone, exaltone and muscone. **[3L]**
15.	**(To be announced later)**	**(To be announced later)**	**Unit 3: Biomolecules – IV [15L]** **3.1** Role of main enzymes involved in the synthesis and breakdown of glycogen. **[2L]** **3.2** Enzyme catalyzed organic reactions: Hydrolysis, hydroxylation, oxidation and reduction**.** **[6L]** **3.3** Enzymes in organic synthesis. Fermentation: Production of drugs/ drug intermediates by fermentation. Production of chiral hydroxy acids, vitamins, amino acids, β-lactam antibiotics. Synthesis of chemicals via microbial transformation, synthesis of L-ephedrine. Chemical processes with isolated enzymes in free form (hydrocyanation of m-phenoxybenzaldehyde) / immobilized form (production of 6-aminopenicillanic acid). **[7L]**

16	**To be announced later**		**Paper IV: Unit 1: Drug design, development and synthesis: [15L]** **1.1** Introduction to Quantitative Structure Activity Relationship studies. QSAR parameters - Steric effects: The Taft and other equations; Methods used to correlate physicochemical parameters with biological activity: Hansch analysis - A linear multiple regression analysis.[5L] **1.2** Introduction to modern methods of drug design and synthesis - computer-aided molecular graphics based drug design, drug design via enzyme inhibition (reversible and irreversible), biotechnology and drug design. [3L] **1.3** 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]** **1.4** Synthesis and application of the following drugs: Fluoxetine, oxyphenbutazone, cetrizine, esomeprazole, fluconazole, zidovudine, methotrexate, diclofenac, labetalol, fenofibrate.