UNIVERSITY OF MUMBAI

TIME-TABLE OF POST- GRADUATE LECTURES FOR MSc-PART-I (SEMESTER-II) STUDENTS FOR THANE ZONE

ACADEMIC YEAR 2018-2019

Co-Ordinator :Dr. Vasant.B.Patil. (Contact No. 8554954802)

Sr. No	Name	Days &Dates	Topic	Lec
01	Mrs. Ruby K. 2.00pm-4.00pm 2.00pm-3.00pm C.H.M College	Mondays Jan:28 Feb:4,11,18,25 Mar:11,18 Mar:25	**PSCH 202: Unit-IV Bioinorganic Chemistry** 4.1 Biological oxygen carriers; hemoglobin, hemerythrene and hemocyanine-structure of metal active centre and differences between hemoglobin and myoglobin: Co-operativity of oxygen binding in hemoglobin and Hill equation, pH dependence of oxygen affinity in hemoglobin and myoglobin and it's implications. 4.2 Activation of oxygen in biological system with examples of mono-oxygenases, and oxidases- structure of the metal centre and mechanism of oxygen activation by these enzymes. 4.3 Copper containing enzymes- Superoxide Dismutase, tyrosinase and laccase: catalytic reactions and the structures of the metal binding site 4.4 Nitrogen fixation- nitrogenase, hydrogenases. 4.5 Metal ion transport and storage: Ionophores, transferrin, ferritin and metallothionins. 4.6 Medicinal applications of cis-platin and related compounds.	15L
02	Dr.Manisha Khemani 5.00pm-6.00pm 3.00pm-6.00pm 2.00p.m-6.00pm	Mondays Jan:28 Feb:4,11,18,25 Mar:25 Apr:1,8,15	**PSCH 203: Unit-I** 1.1 Alkylation of Nucleophilic CarbonIntermediates: 1.1.1 Generation of carbanion, kinetic and thermodynamic enolate formation, Regioselectivity in enolate formation, alkylation of enolates. 1.1.2 Generation and alkylation of dianion, medium effects in the alkylation of enolates, oxygen versus carbon as the site of alkylation. 1.1.3 Alkylation of aldehydes, ketones, esters, amides and nitriles. 1.1.4 Nitrogen analogs of enols and enolates- Enamines and Imines anions,alkylation of enamines and imines.	30L

	2.00p.m-3.00pm C.H.M.College	Apr:22	1.1.5 Alkylation of carbon nucleophiles by conjugate addition (Michael reaction). 1.2 Reaction of carbon nucleophiles with carbonyl groups: 1.2.1 Mechanism of Acid and base catalyzed Aldol condensation, Mixed Aldol condensation with aromatic aldehydes, regiochemistry in mixed reactions of aliphatic aldehydes and ketones, intramolecular Aldol reaction and Robinson annulation. 1.2.2 Addition reactions with amines and iminium ions, Mannich reaction. 1.2.3 Amine catalyzed condensation reaction: Knoevenagel reaction. 1.2.4 Acylation of carbanions. **PSCH 203: Unit-IV NMR Spectroscopy and Mass spectrometry.** 4.1 Proton magnetic resonance spectroscopy: Principle, chemical shift, Factors affecting chemical shift (Electronegativity, H- bonding, Anisotropy effects). Chemical and magnetic equivalence, Chemical shift values and correlation for protons bonded to carbon and other nuclei as in alcohols, phenols, enols, carboxylic acids, amines, amides. Spin-spin coupling, coupling constant (J), factors affecting J, germinal, vicinal and long range coupling (allylic and aromatic.). First order spectra, Karplus equation. 4.2 ^{13} C NMR spectroscopy: Theory and comparison with proton NMR, proton coupled and decoupled spectra, off-resonance decoupling. Factors influencing carbon shifts, correlation of chemical shifts of aliphatic, olefin, alkyne, aromatic and carbonyl carbons. 4.3 Mass spectrometry: Molecular ion peak, base peak, isotopic abundance, metastable ions. Nitrogen rule. Determination of molecular formula of organic compounds based on isotopic abundance and HRMS. Fragmentation pattern in various classes of organic compounds (including compounds containing hetero atoms), McLafferty rearrangement, Retro-Diels-Alder reaction, ortho effect. 4.4 Structure determination involving individual or combined use of the above spectral techniques.	
03	Dr. Yogini B.	Tuesdays.	**PSCH 202: Unit-I Inorganic Reaction Mechanism:** 1.1 Rate of reactions, factors affecting the rate of reactions, techniques for	15L

	2.00pm-5.00pm C.H.M College	Jan:29 Feb:5,12,26 Mar:5	determination of rate of reaction (Direct chemical analysis, spectrophotometric method, electrochemical and flow methods) 1.2 Ligand substitution reactions of: a) Octahedral complexes without breaking of metal-ligand bond(Use of isotopic labeling method) b) Square planar complexes, trans effect, it's theories and applications. Mechanism and factors affecting these substitution reactions. 1.3 Redox reactions: inner and outer sphere mechanisms, complementary and non-complementary reactions. 1.4 Stereochemistry of substitution reactions of octahedral complexes. (Isomerization and racemization reactions and applications.)	
04	Mrs. Ruby K. 1.00pm-6.00pm C.H.M College	Tuesdays Mar:12,19,26 April:2,9,16	**PSCH 204: Unit-II** 2.1X-ray spectroscopy: principle, instrumentation and applications of X-ray fluorescence, absorption and diffraction spectroscopy. 2.2 Mass spectrometry: recapitulation, instrumentation, ion sources for molecular studies, electron impact, field ionization, field ionization, field absorption, chemical ionization and fast atom bombardment sources. Mass analyzers: Quadrupole, time of flight and ion trap. Applications. 2.3 Radioanalytical Methods_ recapitulation, isotope dilution method, introduction, principle,single dilution method, double dilution method and applications. **PSCH 204: Unit-III** 3.1 Surface Analytical Techniques Introduction, Principle, Instrumentation and Applications of: 3.1.1 Scanning Electron Microscopy(SEM) 3.1.2 Scanning Tunneling Microscopy(STM) 3.1.3 Transmission Electron Microscopy (TEM) 3.1.4 Electron Spectroscopy (ESCA and Auger) 3.2 Atomic Spectroscopy 3.2.1 Advantages and limitations of AAS 3.2.2 Atomic Spectroscopy based on plasma sources- Introduction, Principle, Instrumentation and Applications.	30L

05	Dr. V.B. Patil 2.00pm-4.00pm 2.00pm-6.00pm 2.00p.m-4.00p.m C.H.M. College	Wednesdays Jan:23,30 Feb:6,13,20,27 Mar:6,13 Mar:20,27 Apr:3, Apr:10	**PSCH201-Unit-I Chemical Thermodynamics II** 1.1 Fugacity of real gases, Determination of fugacity of real gases using graphical method and from equation of state. Equilibrium constant for real gases in terms of fugacity. Gibb's energy of mixing, entropy and enthalpy of mixing. 1.2 Real solutions: Chemical potential in non ideal solutions, excess functions of non ideal solutions, calculation of partial molar volume and partial molar enthalpy, Gibb's Duhem Margules equation. 1.3 Thermodynamics of surfaces, Pressure difference across curved surface (Laplace equation), vapour pressure of droplets(Kelvin equation), Gibb's adsorption isotherm, BET isotherm (derivations expected). 1.4 Bioenergies: Standard free energy change in biochemical reactions, exergonic, endergonic. Hydrolysis of ATP, synthesis of ATP from ADP. **PSCH201-Unit-III Chemical Kinetics and Molecular Reaction Dynamics.** 3.1Elementary Reactions in Solution: Solvent Effects on reaction rates, Reactions between ions-influence of solvent .Dielectric constant, influence of ionic strength, Linear free energy relationships. Enzyme action. 3.2 Kinetics of reactions catalyzed by enzymes- Michaelis-Menten analysis, Lineweaver- Burk and Eadie Analyses. 3.3 Inhibition of Enzyme action: Competitive, noncompetitive and Uncompetitive Inhibition. Effect of pH, Enzyme activation by metal ions, Regulatory enzymes. 3.4 Kinetics of reactions in the solid State: Factors affecting reactions in solids. Rate laws for reactions in solid: The parabolic rate law, The first order rate law, the contracting sphere rate law, some examples of kinetic studies.	30L
06	Dr.C.L.Patil 4.00pm-6.00pm 4.00pm-5.00pm	Wednesdays Jan:23,30 Feb:6,13,20,27 Mar:6 Mar:13	**PSCH 202: Unit-II Organometallic Chemistry of Transition metals:** 2.1 Eighteen and sixteen electron rule and electron counting with examples. 2.2 Preparation and properties of the following compounds. a) Alkyl and aryl derivatives of Pd and Pt complexes. b) Carbenes and carbynes of Cr, Mo, and W. c) Alkene derivatives of Pd and Pt. d) Alkyne derivatives of Pd and Pt.	15L

	C.H.M.College		e) Allyl derivatives of nickel. f) Sandwich compounds of Fe, Cr and Half Sandwich compounds of Cr, Mo. 2.3 Structure and bonding on the basis of V.B.T. and M.O.T.in the following organometallic compounds: Zeise's salt, bis(triphenylphosphine)diphenylacetylene platinum (0) $[Pt(PPh_3)_2(CH{\equiv}CPh)_2]$, diallylnickel(II), ferrocene and bis(arene) chromium(0), Tricarbonyl(η^2-butadiene) iron(0).	
07	Dr. Sandeep Kotwal 2.00pm-4.00pm 2.00pm-3.00pm C.H.M. College	Thursdays Jan:24,31 Feb:7,14,21,28 Mar:7 Mar:14	**PSCH 203:Unit-II Reactions and Rearrangements: Mechanisms, stereochemistry (if applicable) and applications of the following:** 2.1 Reactions : Baylis- Hilman reaction, McMurry Coupling,Corey-Fuchs reaction, Nef reaction, Passerini reaction. 2.2 Concerted rearrangements: Hofmann, Curtius, Lossen, Schmidt, Wolff, Boulton-Katritzky. 2.3 Cationic rearrangements: Tiffeneau-Demjanov, Pummerer, Dienone-phenol, Rupe, Wagner-Meerwein. 2.4Anionic rearrangements: Brook, Neber, Von Ritcher, Witting, Gabriel-Colman, Payne.	15L
08	Dr. A.D.Tiwari 4.00pm-6.00pm 3.00pm-4.00pm C.H.M College	Thursdays Jan:24,31 Feb:7,14,21,28 Mar:7 Mar:14	**PSCH202-Unit-III Environmental Chemistry** 3.1 Conception of Heavy Metals: Critical discussion on heavy metals. 3.2 Toxicity of metallic species: Mercury. Lead, cadmium. Arsenic, copper and chromium with respect to their sources, distribution, speciation, biochemical effects and toxicology, control and treatment. 3.3 Case Studies: a) Itai-Itai disease for Cadmium toxicity b) Arsenic poisoning in the Indo-Bangladesh region. 3.4 Interaction of radiation in context with the environment: Sources and biological implication of radioactive materials. Effect of low level radiation on cells. It's applications in diagnosis and treatment . Effect of radiation on cell proliferation and cancer.	15L

09	Dr. Nagesh Sutar 2.00pm-4.00pm 2.00pm-3.00pm C.H.M.College	Fridays Feb:1,8,15,22 Mar:1,8,15, Mar:22	**PSCH203- UNIT-III** **3.1Introduction to Molecular Orbital Theory for Organic Chemistry:** 3.1.1.Molecular Orbitals:Formation of σ andπ- MOs by using LCAO method. Formation of π MOs of ethylene, butadiene, 1,3,5-hexatriene, allyl cation, anion and radical. Concept of nodal planes and energies of π-MOs. 3.1.2. Introduction to FMOs: HOMO and LUMO and significance of HOMO-LUMO gap in absorption spectra as well as chemical reactions. MOs of formaldehyde: The effect of electronegativity perturbation and orbital polarization in formaldehyde.HOMO and LUMO (π andπ* orbitals). A brief description of MOs of nucleophiles and electrophiles. Concept of 'donor-acceptor' interactions in nucleophilic addition reactions on formaldehyde. Connection of this HOMO-LUMO interaction with 'curved arrows' used in reaction mechanisms. The concept of hardness and softness and its application to electrophiles and nucleophiles. Examples of hard and soft nucleophiles/ electrophiles. Identification of hard and soft reactive sites on the basis of MOs. 3.1.3.Application of FMO concepts in (a) S_N^2 reaction, (b)Lewis acid base adducts (BF_3-NH_3 complex), (c) ethylene dimerization to butadiene, (d) Diels-Alder cycloaddition, (e) regioselective reaction of allyl cation with allyl anion (f) addition of hydride to formaldehyde. 3.2 Applications of UV and IR Spectroscopy: 3.2.1 Ultraviolet spectroscopy: Recapitulation, UV spectra of dienes, conjugated polyenes(cyclic and acyclic),carbonyl and unsaturated carbonyl compounds, substituted aromatic compounds.Factors affecting the position and intensity of UV bands-effect of conjugation, steric factor, pH, and solvent polarity. Calculation of absorption maxima for above classes of compounds by Woodward –Fieser rules (using Woodward- Fieser tables for values for substituents). 3.2.2.Infrared Spectroscopy: Fundamental, overtone and combination bands, vibrational coupling, factors affecting vibrational frequency(atomic weight, conjugation, ring size,solvent and hydrogen bonding), Characteristic vibrational frequencies for alkanes, alkenes,alkynes, aromatics, alcohols,ethers,phenols,amines,nitriles and nitro compounds. Detailed study of vibrational frequencies of carbonyl compounds,	15L

			aldehydes,ketones,esters,amides,acids,acidhalides,anhydrides,lactones,lactams	
10	Dr. Neena Anand 4.00pm-6.00pm 3.00pm-4.00pm C.H.M. College	Fridays Feb:1,8,15,22 Mar:1,8,15, Mar:22	PSCH 204 - UNIT-I β-unsaturated carbonyl compounds. Chromatography 1.1 Recapitulation of basic concepts in chromatography: Classification of chromatographic methods, requirements of an ideal detector, types of detectors in LC and GC, comparative account of detectors with reference to their applications (LC and GC respectively), qualitative analysis. 1.2 Concept of plate and rate theories in chromatography: efficiency, resolution, selectivity and separation capability. Van Deemter equation and broadening of chromatographic peaks. Optimization of chromatographic conditions. 1.3 Gas Chromatography: Instrumentation of GC with special reference to sample injection systems- split/ splitless, column types, solid/ liquid stationary phases, column switching techniques, temperature programming, Thermionic and mass spectrometric detector, applications. 1.4 High Performance Liquid Chromatography (HPLC): Normal phase and reversed phase with special reference to types of commercially available columns (Use of C8 and C18 columns). Diode array type and fluorescence detector, applications of HPLC. Chiral and ion chromatography.	15L
11.	Dr. V.B. Patil 1.00pm-4.00pm C.H.M College	Saturdays Feb:2,9,16,23 Mar:2,9,16 Mar:23,30 Apr:13	**PSCH204-Unit-IV Electroanalytical Methods(Numericals are expected)** [15L] 4.1Ion selective potentiometry and polarography: Ion selective electrodes and their applications (solid state precipitate, liquid-liquid, enzyme and gas sensing electrodes), ion selective field effect transistors, biocatalytic membrane electrodes and enzyme based biosensors. Polarography: Ilkovic equation, derivation starting with Cottrell equation, effect of complex formation on the polarographic waves. 4.2 Electrogravimetry: Introduction, principle, instrumentation, factors affecting the nature of the deposit, applications. 4.3 Coulometry: Introduction, principle, instrumentation, coulometry at controlled potential and controlled current. **PSCH201-Unit-IV Solid State Chemistry and Phase Equilibria** [15L] 4.1Solid State Chemistry	30L

			4.1.1 Recapitulation: Structures and defects in solids. Types of defects and Stoichiometry a) Zero dimensional (point) Defects. b) One dimensional (line) Defects. c) Two dimensional (planar) Defects. d) Thermodynamics of formation of defects (Mathematical derivationto find concentration of defects and numerical problems based on it) 4.2 Phase equilibria 4.2.1 Recapitulation: Introduction and definition of terms involved in phase rule. Thermodynamic derivation of Gibbs phase rule. 4.2.2. Two component system: a) Solid-gas system: Hydrate formation, Amino compound formation b) Solid-Liquid System: Formation of a compound with congruent melting point, Formation of a compound with incongruent melting point. (with suitable examples) 4.2.3. Three component system Type-I : Formation of one pair of partially miscible liquids. Type-II: Formation of two pairs of partially miscible liquids. Type-III: Formation of three pairs of partially miscible liquids	
12	Mrs. Sheela Vasu 4.00pm-6.00pm 4.00pm-5.00pm C.H.M. College	Saturdays Feb:2,9,16,23 Mar:2,9,16 Mar:23	**PSCH201-Unit-II Quantum Chemistry II** 2.1 Rigid rotor, spherical co-ordinates. Schrodinger wave equation in spherical co-ordinates, separation of the variables, the phi equation in spherical number, the theta equation, wave function, quantization of rotational energy, spherical harmonics. 2.2 Hydrogen atom, the two particle problem, separation of the energy as translational and potential, separation of variables, the R , the θ, and the ϕ equations, solution of the R equation, introduction of the four quantum numbers and their interdependence on the basis of the solutions of the three equations, total wave function, expression for the energy, probability density function, distances and energies in atomic units, radial and angular plots, points of maximum probability, expressions for the total wave function for 1s, 2s, 2p and 3d orbitals of hydrogen. 2.3Application of the Schrodinger equation to two electron system, limitations of	15L

			the equation , need for the approximate solutions, methods of obtaining the solution of the Schrodinger wave equation. 2.4 Huckel Molecular Orbital theory for ethylene, 1,3-butadiene and benzene.(Derivation expected).	

M. Sc.- Part – I (Semester - II) Chemistry

2018-19

NOTE: - Attention of the post-graduate students (Part - I) (Sem. - II) 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.
12th February, 2019.

Sd/-
Assistant Registrar,
Post Graduate Studies Section

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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 2018-2019 within 15 days after completion of their lectures in the respective terms are over, to the Coordinator at the respective centre.

No. PG/ICD/2018-19 2135 of 2019.

12th February, 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 **Chemistry** and the Principals of the respective colleges for information and necessary action.

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12th February, 2019.

P.S. Jhunjhe 12/2/19
Assistant Registrar,
Post Graduate Studies Section
12/02/19