# UVERSITY OF MUMBAI ZONE – I

## TIME TABLE OF POST-GRADUATE LECTURES FOR M. SC. – I (SEM I ) IN CHEMISTRY FOR THE ACADEMIC YEAR 2016-17.

## SEMESTER-I

Place : **K.C. College, Churchgate, Mumbai-400 020. Room No. 405.**
Lectures will commence from: **August 1,2016**
Coordinator: **Dr. (Smt.) Sushil Puniyani, K.C.College, Mob.: 9320011844.**

| Sr. No. | Name of Teacher | Days and Dates | Paper and Topic |
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| 1. | Dr. Sunetra Chaudhary<br><br>2.30 p.m. to 3.30 p.m.<br><br>(K.C.College) | Mondays<br><br>August:1,8,22,29<br>Sept: 5,22,19,26<br>Oct:3,10 | Paper I Unit I [15L]<br>**1.1** State function and exact differentials. Maxell equations, Maxwell thermodynamic square, Joule Thomson experiment, Joule Thomson coefficient, inversion temperature, Joule Thomson coefficient in terms of van der Waals constants, Temperature dependence of enthalpy and entropy , Gibbs energy of reaction<br>**1.2** Third law of Thermodynamics, Entropy change for a phase transition, absolute entropies, determination of absolute entropies in terms of heat capacity data, standard molar entropies and their dependence on molecular mass and molecular structure. Residual entropy. |
| 2. | Dr S. Dasgupta<br><br>3.30 pm to 5.30 pm<br><br>3.30 pm to 4.30 pm<br><br>Jai Hind College | Mondays<br><br>August:1,8,22,29<br><br>Sept: 5,12,19,26<br>Oct:3,10 | Paper III / Unit II: 15L<br>2. Physical Organic Chemistry<br>**2.1** Thermodynamic and kinetic requirements of a reaction: Transition state theory, Hammond's postulate, Principle of microscopic reversibility, Kinetics vs thermodynamic control.<br>**2.2**. Acids and bases:Factors affecting acidity & basicity. Acid & base catalysis - specific & general catalysis.<br>**2.3** Determining mechanism of a reaction: Product analysis, Kinetic studies, Stereochemical outcome, Detection and trapping of intermediates, Crossover experiments, Kinetic isotope effect –primary kinetic & secondary kinetic isotope effect<br>**2.4** Elimination Reactions<br>Types of elimination reactions.$E_1$, $E_2$ and $E_1cB$ mechanisms.<br>Pyrolytic elimination:Chugaev reaction, Cope reaction and Pyrolysis of acetates. |

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| 3. | Dr. Gokul Ganesan<br><br>4.30 pm to 5.30 pm<br><br>Jai Hind College | Mondays<br><br>Sept: 5,12,19,26<br>Oct:3,10 | 1.3.Aromaticity 7L<br>1.3.1. Structural, thermochemical, and magnetic criteria for aromaticity, including NMR characteristics of aromatic systems. Delocalization and aromaticity.<br>1.3.2. Application of HMO theory to monocyclic conjugated systems. Frost-Muslin diagrams. Huckel's (4n+2) and 4n rules.<br>1.3.3. Aromatic and antiaromatic compounds upto 18 carbon atoms. Aromaticity of benzenoid systems, heterocycles, metallocenes, azulenes, annulenes and tropyliumcations. Homoaromatic compounds. |
| 4. | Dr Sheela Valecha<br><br>2.30pm to 3.30pm<br><br>K C College | Tuesdays<br><br>August:2,9,16,23, 30<br>Sept: 6,13,20,27<br>Oct:4,11,18 | Paper II / Unit – IV 15L<br>Spectral and Magnetic Methods<br>(i) Interpretation of electronic spectra for octahedral (Ni(II) and Cr(III)) and square planar complexes for $d^8$ ions [Ni(II), Pd(II), Pt(II)], IR and Raman spectroscopy with reference to metal- nitrogen, metal-oxygen and metal-sulfur bonds.<br>Paper II / Unit - IV<br>i) Spectroscopic methods viz., Job's method, mole-ratio and slope-ratio methods for<br>determination of stepwise formation constants of metal complexes.<br>(iii) Application of ESR and magnetic susceptibility studies of metal complexes:<br>interpretation of ESR spectra of Cu(II) complexes (octahedral, square planar and tetragonal complexes) and susceptibility results for the same<br><br>. |
| 5. | Dr Prashant<br><br>3.30pm to 4.30pm<br><br>Kirti College | Tuesdays<br>August:2,9,16,23, 30<br>Sept: 6,13,20,27<br>Oct:4,11,18 | Paper III/ Unit III 15L<br>Stereochemistry |

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| 6. | Dr Jamson<br><br>4.30pm to 5.30pm<br>Wilson college | Tuesdays<br>August:2,9,16,23, 30<br>Sept: 6,13,20,27<br>Oct:4,11,18 | Paper IV / Unit IV 15L<br>4.1General classification of chromatographic methods: column efficiency, plate and rate theories, resolution, selectivity and separation capability, Van Deemter equation,[ quantitative treatment and mathematical derivations not expected.]<br>4.2Gas chromatography: instrumentation, sample introduction systems, packed and capillary columns, detectors: selectivity, limit of detection, operative principles<br>ofcoulometric, thermionic and NP detectors, temperature programming, applications in various fields.<br>4.3HPLC: column efficiency in LC, mobile phase reservoirs, solvent treatment systems pumping systems, sample introduction systems, types of columns, detectors: EC and diode array detectors, fluorimetic detectors. |
| 7 | Dr Yogita Shinde<br><br>2,30pm to 3.30 pm<br><br>K. C. College | Wednesdays<br><br>August:3,10,17,24, 31<br>Sept:7,14,21,28<br>Oct:5,12,19 | Paper IV / Unit II Chemometrics:The following topics are to be covered in the form of numerical problems only. 15L<br>A] Concentration of a solution based on volume and mass units.<br>B] Calculations of ppm, ppb and dilution of the solutions, concept of mmol<br>C] Stoichiometry of chemical reactions, concept of kgmol, limiting reactant, theoretical and practical yield.<br>D] Solubility and solubility equilibria, effect of presence of common ion.<br>E] Calculations of pH of acids, bases and acidic and basic buffers.<br>F] Concept of formation constants, stability and instability constants, step wise formation constants. |
| 8 | Dr. Sudheer Lingayat<br><br>3.30 p.m. to 5.30 p.m.<br><br>Khalsa college | Wednesdays<br><br>August:3,10,17,24, 31<br>Sept:7,14 | Paper II / Unit I<br>Topic - Inorganic Reaction Mechanisms 15L<br>Rate of reactions, factors affecting the rate of reactions, techniques for determination of rate of reaction.<br><br>Ligand substitution reactions of (a) octahedral complexes without breaking of metal- ligand bond, (b) square planar complexes – trans-effect, its theories and applications. Mechanism and factors affecting these substitution reactions and (c) Tetrahedral complexes.<br>Redox reactions: electron and atom transfer reactions, inner and outer sphere mechanisms, Marcus theory, complimentary and non-complimentary reactions.<br>(iv) Isomerization and racemization reactions. |

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| | Dr Shelke P.B.<br><br>3.30pm to 5.30pm<br><br>Kirti College | Sept:21,28<br>Oct:5,12, | Paper III/Unit I 8L<br>1. Molecular Orbital Theory for organic chemistry<br>**1.1.** LCAO and MOs: FMOs of ethylene, higher polyenes, and benzene and their energies. Effect of conjugation on stability and reactivity of polyenes.<br><br>**1.2**.FMOs: Use of FMOs in ethylene dimerization to cyclobutane, Diels-Alder reaction, reaction of allylcation with allyl anion, reactivity of carbonyl group. Significance of HOMO-LUMO gap in absorption spectra and chemical reactions. FMOs of hard and soft acids and bases, nucleophiles and electrophiles. |
| 10. | Dr. Rajesh Samant<br><br>2.30 pm to 3.30pm<br><br>K C College | Thursdays<br>August:4,11,18,25<br>Sept:1,8,15,22,29<br>Oct:6,1,20 | Paper IV / Unit I 15L<br><br>1.1 Introduction to Analytical Chemistry: Classification of analytical methods, an overview of analytical methods, types of instrumental methods, instruments for analysis, data domains, electrical and non electrical domains, detectors, transducers and sensors, selection of an analytical method, accuracy, precision, selectivity, sensitivity, detection limit and dynamic range, classification of techniques: calibration curve, standard addition and internal standard methods.<br><br>1.2 Quality in analytical chemistry: quality systems in chemical laboratories, cost and benefits of a quality system, types of quality standards for laboratories, total quality management, quality audits and quality reviews, responsibility of laboratory staff for quality. |
| 11 | Dr. Chandan<br><br>3.30 p.m. to 4.30 p.m.<br><br>(Siddharth College) | Thursdays<br><br>August:4,11,18,25<br>Sept:1,8,15,22,29<br>Oct:6,13,20 | Paper III / Unit IV 15L<br><br>4.Oxidation<br>Generalmechanism, selectivity, and important applications of the following:<br><br>4.1 Dehydrogenation of C-C bonds including aromatization of six membered rings using metal (Pt, Pd, Ni) and organic reagents (chloranil, DDQ).<br>4.2 Dehydrogenation/oxidation of alcohols to aldehydes and ketones: chromium reagents such as $K_2Cr_2O_7/H_2SO_4$ (Jones reagent), $CrO_3$-pyridine (Collin's reagent), PCC (Corey's reagent) and PDC, hypervalent iodine reagents (IBX, Dess-Martin periodinane). DMSO based reagents (Swern oxidation) and Oppenauer oxidation.<br>4.3 Oxidation involving C-C bonds cleavage: Glycols using $HIO_4$; cycloalkanones using $CrO_3$; carbon-carbon double bond using ozone, $KMnO_4$, $CrO_3$, $NaIO_4$ and $OsO_4$; aromatic rings using $RuO_4$ and $NaIO_4$. |

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| | | | 4.4 Oxidation involving replacement of hydrogen by oxygen: oxidation of $CH_2$ to CO by $SeO_2$, Oxidation of aryl methanesby$CrO_2Cl_2$ (Etard oxidation).<br><br>4.5 Oxidation of aldehydes and ketones: with$H_2O_2$ (Dakin reaction), with peracid (Baeyer-Villiger oxidation).<br><br>4.6.Reduction<br><br>General mechanism, selectivity, and important applications of the following reducing reagents:<br>4.6.1 Reduction of CO to $CH_2$ in aldehydes and ketones - Clemmensen reduction, Wolff-Kishner reduction and Huang-Minlon modification. Ra-Ni desulfurization of thioketal<br><br>4.6.2Metal hydride reduction: Boron reagents ($NaBH_4$, $NaCNBH_3$, $Na(OAc)_3BH$), aluminium reagents ($LiAlH_4$, DIBALH, Red Al, L and K selectrides). $NH_2NH_2$ (diimide reduction) and other non-metal based agents including organic reducing agents (Hantzschdihydropyridine).<br><br>4.6.3. Dissolving metal reductions: using Zn, Li, Na, and Mg under neutral and acidic conditions, Li/Na-liquid $NH_3$ mediated reduction (Birch reduction) of aromatic compounds and acetylenes |
| 12 | Dr. Suraj Purandare<br><br>4.30 p.m. to 5.30 p.m.<br><br>(SiddharthCollege) | Thursdays<br><br>August:4,11,18,25<br>Sept:1,8,15,22,29<br>Oct:6,13,20 | Paper I / Unit II<br>*Topic - Thermodynamics-II 15L*<br>2.1 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.<br>Gibbs energy of mixing, entropy and enthalpy of mixing.<br><br>2.2 Real solutions: Chemical potential in non ideal solutions excess functions of non ideal<br>solutions calculation of partial molar volume and partial molar enthalpy, Gibbs DuhemMargules equation.<br><br>2.3 Applications of thermodynamic functions to life processesEntropy and free energy changes of a biochemical reaction, Free energy changes involved in reactions that synthesize and utilize ATP. |

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| 13 | Dr. Shipra Biswas<br><br>2.30 p.m to 3.30 p.m<br><br>Jai Hind College | Fridays<br>August:5,12,19,26<br>Sept:2,9,16,23,30<br>Oct:7,14,21 | Paper II / Unit II 15L<br>*Topic - Organometallic Chemistry*<br>(i) Organometallic compounds of transition metals: Preparation and properties of the following organometallic compounds: (a) Alkyl and Aryl derivatives, (b) Carbenes and Carbynes, (c) Alkene complexes, (d) Alkyne complexes, (e) Allyl complexes, (f) Cyclopentadiene complexes and (g) Arene complexes (sandwich and half sandwich complexes).<br>(ii) Structure and bonding in Zeise's salt, bis(triphenylphosphine) diphenylacetylene platinum(0), diallyl nickel, ferrocene and dibenzene chromium(0).<br>(iii) Sixteen electron rule and electron counting with examples. |
| 14 | Dr. I A. Mendes<br><br>3.30 p.m. to 5.30 p.m.<br><br>(SophiaCollege ) | Fridays<br>August:5,12,19,26<br>Sept:2,9,16,23 | Paper I / Unit IV<br>Topic - Electrochemistry<br><br>4.1 Debye-Huckel theory of activity coefficient, Debye-Huckel limiting law and it's extension to higher concentration (derivation expected).<br>4.2. Electrolytic conductance and ionic interaction, relaxation effect,. Debye-Huckel-Onsager equation (derivation expected). Validity of this equation for aqueous and non-aqueous solution, deviations from Onsager equation, Debye -Falkenhagen effect (dispersion of conductance at high frequencies), Wien effect.<br>4. 3 Batteries: Alkaline fuel cells, Phosphoric acid fuel cells, High temperature fuel cells,<br>General development of a fuel cell based technology.<br>4. 4 Bioelectrochemistry: Introduction, cells and membranes, membrane potentials, theory of membrane potentials, interfacial electron transfer in biological systems, adsorption of proteins onto metals from solution, electron transferrom modified metals to dissolved protein in solution, enzymes as electrodes, lectrochemical enzyme-catalysed oxidation of styrene. |
| 15 | Dr Beena Arora<br><br>3.30pm to 5.30pm<br><br>M D College | Fridays<br><br>Sept:30<br>Oct:7,14,21 | Paper II / Unit III<br>*Materials Chemistry and Nanomaterials*<br>(i) SolidState Chemistry<br>(a) Electronic structure of solids and band theory, Fermi level, K Space and Brillouin Zones.<br>(b) Structures of Compounds of the type : AB [nickel arsenide (NiAs)], $AB_2$ [fluorite($CaF_2$) and antifluorite structures, rutile ($TiO_2$) structure and layer structure [cadmium chloride and iodide ($CdCl_2$, $CdI_2$)]. |

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| 16 | Dr. Parbat<br><br>2.30 pm to 4.30pm<br>Wilson college | Saturdays<br><br>August:6,13,20,27<br>Sept:,10,17,24 | Paper I / Unit III<br>Applied thermodynamics<br>Two component system<br>(Solid –Gas System) I-Hydrate formation II- Amino compound formation<br>(Solid – Liquid System) I – Formation of a compound with congruent melting point<br>II- Formation of a compound with incongruent melting point<br>3.2<br>Recapitulation: Graphical representation of three component system; system of three liquids: having partial miscibility.<br>Type-I Formation of one pair of partially miscible liquids<br>Type-II Formation of two pairs of partially miscible liquids<br>Type-III Formation of three pairs of partially miscible liquids<br>3.3<br>**1.**Double salt formation –<br>(a) Double salt not decomposed by water $H_2O$ – $AgNO_3$ – $NH_4NO_3$<br>(b) Double salt decomposed by water $H_2O$ –$AgNO_3$-$KNO_3$<br>One salt forming a hydrate – (a) Hydrate not dehydrated by second salt<br>$H_2O$- $Na_2SO_4$ – NaCl<br>(Hydrate $Na_2So_4$,10 $H_2O$ is formed )<br>(b) Hydrate dehydrated by second salt.<br>$H_2O$- $Na_2SO_4$- NaCl<br>($Na_2SO_4$ is dehydrated by addition of NaCl)<br>3. Double salt forming hydrate –(a) Hydrated double salt not decomposed by water (Alums stable in presence of water)(b)Hydrated double salt decomposed by water<br>3.4 |
| 17 | Dr Mrs A.R.Anthony<br><br>2.30pm to 4.30pm<br><br>M. D. College | Saturdays<br><br>Oct:1,8,15,22 | Paper II / Unit III 8L<br>Material Chemistry and Nanomaterials<br>( c )Methods of preparation for inorganic solids: Ceramic method, precursor method, sol-gel method, microwave synthesis (discussion on principles, examples, merits and demerits are expected).<br>(ii) Nanomaterials<br>(a) Preparative methods Chemical methods : solvolthermal, microwave, coprecipitation, Langmuir Blodgett (L-B) method Biological methods : synthesis using microorganisms<br>(b) Applications in the field of semiconductors and solar cells. |

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| 18 | Dr. Satish Kolte<br><br>4.30 p.m. to 5.30 p.m<br>.<br>(K.C.College) | Saturdays<br><br>August:6,13,20,27<br>Sept:,10,17,24<br>Oct:1,8,15,22 | Paper IV / Unit III 15L<br>3.1Introduction to separation methods in analytical chemistry: precipitation, filtration, distillation, extraction and chromatography, modes of separation in chromatography: adsorption, partition, ion exchange, size exclusion and electrochromatography.<br>3.2 Solvent extraction: Recapitulation, factors affecting the solvent extraction of inorganic species, separation of metal ions as chelates, concept of $[pH]_{1/2}$ and its significance, ion association, solvation with suitable examples,<br>Craig's counter current extraction: principles, apparatus and applications, use of crown ethers in solvent extraction.<br>3.3 Solid phase extraction: principle, process and applications.<br>3.4 HPTLC: conversion of TLC to quantitative measurements, densitometric detectors, fluorimetric detectors. |

**ZONE – I**

**M. Sc. (SEMESTER I) CHEMISTRY 2016-2017**

**NOTE:** Attention of post-graduate students (Part-I)(Semester I) 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.

**Sd/-**

Mumbai–400032. Assistant Registrar
1st August, 2016 UG & PG Section

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**P.S**. Students registered in the colleges for M. Sc. (Part-I) (Semester I ) course in **Chemistry** are requested to attend their lectures as per the above time table for Zone (I). Teacher participating in the scheme of Post-graduate teaching and Instruction for course in the subject of **Chemistry** are hereby requested to submit the attendance rolls in respect of the lectures delivered by them during the academic year 2016-2017 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 **Chemistry** are hereby informed that no change will be permitted in the venue and timings of the lectures.

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No.PG/2/ICD/2016-2017/1116 of 2016 1st August, 2016

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 **Chemistry** for information and necessary action.

**Sd/-**

Mumbai–400032. Assistant Registrar
1st August, 2016 UG & PG Section

## ZONE – I

## M. Sc. (SEMESTER I) CHEMISTRY 2016-2017

1. K. C. College
2. Jai Hind College
3. Wilson College
4. Bhavan's Hazarimal Somani College
5. Kirti College
6. M. D. College
7. Khalsa College
8. Siddharth College

Students registered in above colleges for M. Sc. (Part-I) (Semester I) will be attending lectures at K.C. College, 4th floor, Chemistry department, Room No. 405