MINUTES OF THE MEETING OF THE BOARD OF STUDIES IN CHEMISTRY HELD ON 21-01-2013 AT 10.00 A.M. IN THE PRESENCE OF HON'BLE VICE-CHANCELLOR AT THE ADMINISTRATIVE BUILDING OF THE SATAVAHANA UNIVERSITY.

MEMBERS PRESENT:

1.	Prof. M.Komal Reddy, Professor, Dept. of Chemistry, UC, SU, KNR	Chairman
2.	Prof. M.S.N.Reddy, Dept. of Chemistry, OU, Hyderabad	Member
3.	Prof. P.Jayaprasad Rao, Dept. of Chemistry, UCS, Saifabad, OU, Hyderabad	Member
4.	Prof. Shivaraj, Dept. of Chemistry, UCS, OU, Hyderabad	Member
5.	Dr. V.Namratha, I/c., Head, Asst. Professor, Dept. of Chemistry, UC, SU, KNR	Member
6.	Dr. V.Chandra Shekar, Asst. Professor, Dept. of Chemistry, UC, SU, KNR	Member
7.	Dr. P.Ramesh, Principal, Govt. Degree College for Women's, Karimnagar	Member
8.	Dr. B.Madhusudan Reddy, Principal, Govt. Degree College, Choppadandi	Member
9.	Dr. M.Buchi Reddy, Govt. Degree College for Women's, Jagtial	Member
10.	Prof. K.Nageshwar Rao, Dean, Faculty of Science, OU, Hyderabad	External Member

The following resolutions were unanimously made:

1. The I-Semester practical pattern is as following:

IC Lab-I	Paper-V	6 Hrs	75 Marks
OC Lab-II	Paper-VI	6 Hrs	75 Marks
PC Lab-III	Paper-VI	6 Hrs	75 Marks

2. In the 3rd & 4th Semester, the student seminar is mandatory and treated as a paper with marks in each paper is 25 (Write-up = 10; Presentation = 15)

3. a) The Internal examination marks is 20 for each paper (Assignment = 5; Test = 15)

Internal test model:	10 multiple choice	= 5
	10 fill in the blanks	= 5
	05 short answer Questions	= 5
	Total	= 15 Marks

   b) The average of two internal exams marks is final.

   c) 1st internal at the end of 8th/9th week & 2nd internal at the end of Semester week is to be conducted.

   d) The internal exam time is 60 minutes (1 Hr).

4. Adopt one common paper in 3rd Semester only. All the four papers in 4th Semester should be from specialization.
5. The CSIR/UGC/NET/SLET exam syllabi should be incorporated in 3rd Semester for the benefit of outgoing students to make them to do well in the Tests.

6. The 1st & 2nd Semester practicals are to be conducted at the end of 2nd Semester (end of year). The 3rd and 4th Semester practicals are to be conducted at the end of 4th Semester.
7. The Ist Semester results in four theory papers should be released at the end of 1st Semester exams.

DEPARTMENT OF CHEMISTRY, SATAVAHANA UNIVERSITY

M.Sc. Chemistry I & II Semester Syllabus

(Effective from the academic year 2012-2013 for University and affiliated colleges)

Semester-I

S.No.	Paper Code	Subject	Paper No.	Hrs/ Week	MARKS		
					Internal exam	Semester exam	Total
1	CH101T	Inorganic Chemistry(IC)-I	I	4	20	80	100
2.	CH102T	Organic Chemistry(OC)-I	II	4	20	80	100
3.	CH103T	Physical Chemistry(PC)-I	III	4	20	80	100
4.	CH104T	Analytical Techniques& Spectroscopy (ASP)-I	IV	4	20	80	100
5.	CH101P	IC Lab-I	V	6		75	75
6.	CH102P	OC Lab-I	VI	6		75	75
7.	CH103P	PC Lab-I	VII	6		75	75
TOTAL							**625**

Semester-II

S.No.	Paper Code	Subject	Paper No.	Hrs/ Week	MARKS		
					Internal exam	Semester exam	Total
1	CH201T	Inorganic Chemistry(IC)-II	I	4	20	80	100
2.	CH202T	Organic Chemistry(OC)-II	II	4	20	80	100
3.	CH203T	Physical Chemistry(PC)-II	III	4	20	80	100
4.	CH204T	Analytical Techniques& Spectroscopy (ASP)-II	IV	4	20	80	100
5.	CH201P	IC Lab-II	V	6		75	75
6.	CH202P	OC Lab-II	VI	6		75	75
7.	CH203P	PC Lab-II	VII	6		75	75
TOTAL							**625**

Semester-I and Semester-II syllabus is common for all specializations i.e., Inorganic, Organic and Physical Chemistry.

(Duration of Examination: Theory 3Hrs Practicals 4Hrs)

M.Sc. CHEMISTRY SYLLABUS
SEMESTER –I
(Effective from the academic year 2012-2013 for University and affiliated colleges)

Paper-I: CH 101T (INORGANIC CHEMISTRY-I) (Marks 100, Total Hours 60)

IC 01: Symmetry of molecules
IC 02: Bonding in Metal Complexes - I
IC 03: Coordination equilibria
IC 04: Ligational aspects of diatomic molecules

IC-01: Symmetry of Molecules: (15Hrs)

Concept of Symmetry in Chemistry – Symmetry Operations – Symmetry Elements : Rotational Axis of Symmetry and Types of Rotational Axes, Plane of Symmetry and types of Planes, Improper Rotational Axis of Symmetry , Inversion Center and Identity Element – More about Symmetry Elements – Molecular Point Groups: Definition and Notation of Point Groups, Classification Molecules in to C_1, C_s , C_i , C_n ,C_{nv} , C_{nh} ,

$C_{\infty v}$, D_n , D_{nh} , D_{nd} ,$D_{\infty h}$, S_n (n=even), T ,T_h , T_d , O , O_h , I, I_h , K_h Groups. Descent in Symmetry with Substitution – Exercises in Molecular Point Groups – Symmetry and Dipole moment – Symmetry criteria for Optical activity..

IC – 02: Bonding in Metal Complexes – I and Magneto Chemistry: (15Hrs)

Crystal Field Theory: Salient features of CFT. d-orbital splitting patterns in regular Octahedral, tetragonally distorted octahedral, Jahn-Tellar theorem-, tetrahedral, square planar, trigonal planar, and linear geometries. Factors influencing the magnitude of crystal field splitting in octahedral complexes – nature of metal ions, nature of ligands, geometry. Concept of weak field and strong fields. - Calculation of crystal field stabilization energies (CFSE's) in six and four coordinate complexes.

Types of magnetic behaviour – magnetic susceptibility – calculation of magnetic moment from magnetic susceptibility spin only formula ,- Quenching of orbital angular momentum – Determination of magnetic moment from Guoy's method . Applications of magnetic moment data for the determination of oxidation states, bond type and stereochemistry.

IC-03: Coordination Equilibria: (15Hrs)

Solvation of metal ions- Binary complexes: Formation of binary Metal Complexes and their stability – types of Stability Constants – relation between them- trends in Step-wise Stability Constants (Factors causing decrease and increase in Step-wise Stability) – Factors influencing the stability constants : (i) Ligand effects: Basicity , Substituent , Steric ,Chelate(size and number of chelate rings) , Macrocyclic and Cryptate effects- (ii) Metal ion effects: Ionic potential, Effective Nuclear charge and Atomic Number (Irving-William's Order, geometry of Metal ion and Ligand) – Chelate effect and its Thermodynamic origin – Jahn-Tellar effect on Stability constants of Metal complexes – Pearson's Theory of Hard and Soft Acids and Bases (HSAB) , Applications of HSAB, Electronegetivity Vs Hardness and Softness. Symbiosis – Methods used for the determination of Stability constants (Basic Principles only): pH metric, Spectrophotometric and Polarographic methods.

Ternary Metal Complexes – definition – Formation of ternary metal complexes – Step-wise and simultaneous equilibria with simple examples.

IC – 04: Ligational Aspects of Diatomic molecules: **(15Hrs)**

Metal Carbonyls:- Carbon monoxide as a ligand – Molecular orbitals of CO - Donor and Acceptor molecular orbitals of CO; Bonding modes of CO- Terminal and Bridging;

Evidence for multiple bonding from Bond lengths and Stretching frequencies;

18 Valence electron rule and its application.

Metal Nitrosyls: - NO as a ligand – Molecular orbitals of NO – Donor and Acceptor components; Bonding modes of NO – Terminal (Linear, Bent) and Bridging;

Structural aspects of $[IrCl(PPh_3)_2(CO)(NO)]^+$ and $[RuCl(PPh_3)_2(NO)_2]^+$.

Stereo chemical control of valence in $[Co(diars)_2(NO)]^{2+}$ and $[Co(diars)_2(NO)(SCN)]^+$.

Metal Dinitrogen complexes: - N_2 as aligand – Molecular orbitals of N_2; Bonding modes – Terminal and Bridging; Stretching frequencies; Structures of Ru (II) and Mo (0) dinitrogen complexes; Chemical fixation of dinitrogen.

References:

1. Symmetry and Group theory in Chemistry, Mark Ladd, Marwood Publishers, London (2000).
2. Molecular Symmetry and Group Theory, Robert L.Carter, John Wiley & Son (1998).
3. Symmetry and Spectroscopy of Molecules. K.Veera Reddy, New Age International (P) Limited (1999).
4. Advanced Inorganic Chemistry. F.A.Cotton, G.Wilkinson, C.A.Murillo and M.Bochmann, 6 th Edition, Wiley Interscience, N.Y (1999
5. Inorganic Chemistry, J.E.Huheey , K.A.Keiter and R.L.Keiter 4 th Edition Harper Cottens College Publications (1993).
6. Homogeneous Catalysis by Metal complexes Vol I, M M Taqui Khan and A E Martell, Academic Press NY (1974).
7. Inorganic Chemistry, Keith F.Purcell and John C.Kotz, Holt-Saunders International Editions, London (1977).

Paper-II: CH 102T (Organic Chemistry-I)

OC-01: Stereo Chemistry
OC-02: Reaction Mechanism-I
OC-03: Carbohydrates and Proteins
OC-04: Heterocyclic Compounds

OC-01: Stereo Chemistry: **(15Hrs)**

Molecular representations: Wedge, Fischer, Newmann, Sawhorse formule, their description and interconversions.

Molecular symmetry and chirality: symmetry operations and symmetry elements and criteria of chirality.

Configurational nomenclature: Axiallychiral allenes spiranes, alkylidene cycloalkanes planar chiral ansa compounds and transcyclooctene.

Determnation of configuration: R, S configuration of organic molecules, E, Z nomenclature for unsaturated compounds. Determination of configuration of E, Z isomers by spectral and chemical methods. Determination of configuration of aldoximes and ketoximes.

Re, Si faces, Prochirality, Racemization and racemic modifications, Resolution techniques.

Principles of chemical reactivity: Kinetic control and thermodynamic control. Introduction to stereoselective synthesis. Concept of dynamic enantiomerism. Atropisomerism.

OC-02: Reaction Mechanism-I: **(15Hrs)**

Reaction Mechanism –I: Investigation of reaction mechanisms, Kinetics, study of Intermediates. Use of isotopes and product analysis. Chemical trapping cross over experiments. Use of IR & NMR in investigation of reaction mechanisms study of reaction intermediates, generation, detection and stability of carbonium ions, carbaniones, nitrenes and free-radicals benzyne. Mechanism of free radical substitution at allylic, Paraffinic, benzylic carbons. Electrocyclic addition to carbon-carbon double bond. Anti addition Bromination and epoxidation followed by ring opening. Syn addition of OSO_4 and $KMno_4$.

OC-03: Carbohydrates and Proteins: **(15Hrs)**

Carbohyrates and Protiens: Carbohydrates: Determinations of the relative and absolute configuration in D (+) Glucose D (-) fructose. Proof for the chair conformation of D(+) glucose. Structure elucidation and synthesis of sucrose. Conformational structures of D (+) ribose deoxy D- ribose, sucrose, lactose, maltose and cellobiose. Structural features of starch cellulose.

Proteins: Acid and enzymatic hydrolysis of proteins. Determination of the amions acid sequence in polypeptides by end group analysis. Polypeptide synthesis. Merrifield resins, solid phase polypeptide synthesis.

OC-04: Heterocyclic Compounds : **(15Hrs)**

Importance of heterocyclics as drugs. Nomenclature, classification of heterocylces based on nature of heteroatom and size of the ring. Π -excessive and $\prod$ deficient heterocycles. Comparitive study on reactivites of furan, Pyrrole and thiophene, synthesis and reactivity of indole, Pyridine, Quinoline, Isoquinoline, Coumarin, benzofuran, carbazole, Acridine.

References:

1. Organic chemistry-volume-l&ll-I L. Finar
2. Heterocycles – R.K.Bansal
3. Heterocyclic chemistry - Joule and Smith
4. stereochemistry of carbon compounds by Ernest L. Eliel and Samuel H.Wilen
5. Stereochemistry of Organic Compounds-Principles and Applications by D.nasipuri
6. Advanced Organic Chemistry by Jerry March
7. Mechanism and Structure in Organic Chemistry S.Mukerjee
8. Guide Book to mechanism in Organic Chemistry,6^{th} Edition,Peter Sykes
9. Organic Chemistry by Morrison and RN Boyd
10. Carbohydrate chemistry by Davidson

Paper-III: CH 103T (PHYSICAL CHEMISTRY-I)

PC-01: Thermodynamics-I
PC-02: Electrochemistry-I
PC-03: Quantum Chemistry-I
PC-04: Chemical Kinetics-I

PC-01: Thermodynamics-I: **(15Hrs)**

Mathematical preliminaries – Derivatives of a function and principles of differentiation (sum, difference, product, quotient, exponential, logarithmic, trigonometric and combined functions), partial differentiation, integral of a function and definite integrals

Thermodynamics- Brief review of concepts of I and II laws of thermodynamics. Concept of entropy. Entropy as a state function. Calculation of entropy changes in various processes. Entropy changes in an ideal gas. Entropy changes on mixing of ideal gases. Entropy as a function of V and T. Entropy as a function of P and T. Entropy change in isolated systems- Clausius inequality. Entropy change as criterion for spontaneity and equilibrium.

Third law of thermodynamics. Evaluation of absolute entropies from heat capacity data for solids, liquids and gases. Standard entropies and entropy changes of chemical reactions. Helmholtz and Gibbs free energies (A and G). A and G as a criteria for equilibrium and spontaneity. Physical significance of A and G. Driving force for chemical reactions- relative signs of ΔH and ΔS.

Thermodynamic relations. Gibbs equations. Maxwell relations. Temperature dependence of G. Gibbs-Helmholtz equation. Pressure dependence of G.

Material equilibrium. Phase equilibium. Clapeyron equation and Clausius-Clapeyron equation .

Temperature dependence of equilibrium constant-the van't Hoff equation.

PC-02: Electrochemistry-I: **(15Hrs)**

Electrochemical Cells : Derivation of Nernst equation – problems. Chemical and concentration cells (with and without transference). Liquid junction potential – derivation of the expression for LJP – its determination and elimination**.** Applications of EMF measurements : Solubility product, potentiometric titrations, determination of transport numbers, equilibrium constant measurements.

Decomposition potential and its significance. Electrode polarization – its causes and elimination. Concentration overpotential.

Debye-Huckel theory of electrolytic solutions. Derivation of Debye-Huckel-Onsager equation – its validity and limitations. Debye-Huckel limiting law (derivation not required). Limitations of Debye-Huckel theory. Extended Debye-Huckel law. Calculation of mean ionic activity coefficient. Concept of activity and activity coefficients in electrolytic solutions. The mean ionic activity coefficient.

Concept of ion association – Bjerrum theory of ion association (elementary treatment) - ion association constant – Debye-Huckel-Bjerrum equation.

PC-03: Quantum Chemistry- I: **(15Hrs)**

Mathematical preliminaries- Simple differential equations and polynomials viz. Hermite, Legender, Associated Legender, Laguerre and Associated Laguerre polynomials (no derivation)

Quantum Chemistry- Black body radiation-Planck's concept of quantization-Planck's equation, average energy of an oscillator (derivation not required). Wave particle duality and uncertain principle-significance

of these for microscopic entities. Emergence of quantum mechanics. Wave mechanics and Schroedinger wave equation.

Operator**s**-operator algebra. Commutation of operators, linear operators.Complex functions. Hermitian operators. Operators ∇ and ∇^2 . Eigenfunctions and eigenvalues. Degeneracy. Linear combination of eigenfunctions of an operator. Well behaved functions. Normalized and orthogonal functions.

Postulates of quantum mechanics. Physical interpretation of wave function. Observables and operators. Measurability of operators. Average values of observables. The time dependent Schrodinger equation. Separation of variables and the time-independent Schrodinger equation..

Theorems of quantum mechanics. Real nature of the eigen values of a Hermitian operator-significance. Orthogonal nature of the eigen values of a Hermitian operator-significance of orthogonality. Expansion of a function in terms of eigenvalues.

PC-04: Chemical Kinetics- I: **(15Hrs)**

Theories of reaction rates : Collision theory, steric factor. Tranition state theory. Reaction coordinate, activated complex and the transition state. Thermodynamic formulation of transition state theory. Activation parameters and their significance. The Eyring equation. Unimolecular reactions and Lindamann's theory.

Complex reactions- Opposing reactions, parallel reactions and consecutive reactions(all first order type). Chain reactions-general characteristics, steady state treatment. Example- H_2-Br_2 reaction. Derivation of rate law.

Effect of structure on reactivity- Linear free energy relationships. Hammett and Taft equations-substituent(σ and σ^*) and reaction constant (ρ and ρ^*)with examples. Deviations from Hammett correlations. reasons- Change of mechanism, resonance interaction. Taft four parameter equation. Correlations for nucleophillic reactions. The Swain – Scott equation and the Edward equation.

The reactivity-selectivity principle and the isoselectivty rule. The intrinsic barrier and Hammond's postulate.

References:

1. Atkin's Physical Chemistry, Peter Atkins and Julio de Paula, Oxford University press
2. Physical Chemistry, Ira N. Levine, McGraw Hill
3. Physical Chemistry-A Molecular approach, D.A. McQuarrie and J.D. Simon, Viva Books Pvt. Ltd
4. Molecular Thermodynamics, D.A. McQuarrie and J.D. Simon, University Science Books
5. Quantum Chemistry, Ira N. Levine, Prentice Hall
6. Introduction to Quantum Chemistry, A.K. Chandra, Tata McGraw Hill
7. Chemical Kinetics, K.J. Laidler, McGraw Hill
8. Kinetics and Mechanism of Chemical Transformations, J. Rajaraman and J. Kuriacose, McMillan
9. Introduction to Electrochemistry, S. Glasstone
10. Modern Electrochemistry, J. O. M. Bockris & A. K. N. Reddy, Plenum
11. Principles of physical chemistry, Samuel H. Maron and Carl F. Prutton, Oxford& IBH
12. The Physical Basis of Organic Chemistry by Howard Maskill, Oxford University Press (New York)
13. Chemical Kinetics and Reaction Mechanisms, J. H. Espenson, McGraw Hill
14. Physical Organic Chemistry, N. S. Isaacs, ELBS

Paper-IV: CH 104T (ANALYTICAL TECHNIQUES and SPECTROSCOPY- I)

ASP 01: Techniques of Chromatography
ASP 02: Rotational and Vibrational spectroscopy
ASP 03: Electronic spectroscopy
ASP 04: NMR spectroscopy-I (^{1}H NMR)

ASP-01: Techniques of Chromatography: **(15Hrs)**

i. Introduction, Classification of chromatographic techniques, differential migration rates, partition ratio, retention time, relation between partition ratio and retention time, capacity factor, selectivity factor. Efficiency of separation- resolution, diffusion, plate theory and rate theory.
ii. **GC:** Principle, instrumentation, detectors- TCD, FID, ECD. Derivatisation techniques, PTGC.
iii. **HPLC:** Principle, instrumentation, detectors- UV detectors, Photodiode array detector, fluorescence detector.
iv. Applications: Methods of quantitation for GC and HPLC: GC analysis of hydrocarbons in a mixture, GC assay of methyl testosterone in tablets, atropine in eye drops. HPLC assy of paracetamol and asprin in tablets.

ASP 02:Rotational and Vibrational spectroscopy: **(15Hrs)**

a) Principles of spectroscopy- Interaction of the electromagnetic radiation with matter, Types of the energies and molecular spectroscopy, Absorption and emission of the radiation

b) Microwave Spectroscopy: Classification of molecules based on moment of inertia. Diatomic molecule as rigid rotator and its rotational energy levels. Selection rules (derivation not required). Calculation of bondlengths from rotational spectra of diatomic molecules. Isotope effect on rotational spectra. Calculation of atomic mass from rotational spectra. Brief description of microwave spectrometer.

c) Vibrational Spectroscopy.

Vibrational energy levels of diatomic molecules, Anharmonic Oscillator, selection rules (derivation not required). Overtones and hot bands, Calculation of force constant of diatomic molecules, Rotational and vibrational spectra of diatomic molecules, PQR brnaches, Instrumentation, sources, sample techniques, Normal modes of vibrations for linear and non-linear molecules (Stretching, bending, scissoring, rocking, twisting, wagging), Functional group frequencies, factors influencing vibrational frequencies, coupled vibrations and Fermi resonance, Combined bands, Applications of the Infra red spectroscopy, structure elucidation of simple organic molecules, Stereochemical effects on the absorption pattern in carbonyl group, cis-trans isomerism and hydrogen bonding. Isotopic effect on group frequency. IR spectra of metal coordinated NO_3^-, SO_4^{2-} and CO_3^{2-} ions.

ASP 03:Electronic spectroscopy: **(15Hrs)**

Electronic spectroscopy: Electronic spectra: Origin of the electronic spectra, Elementary energy levels of molecules-selection rules for electronic spectra; types of electronic transitions in molecules. Chromophores: Congugated dienes, trienes and polyenes, unsaturated carbonyl compounds, benzene and its derivatives, Woodward-Fieser rules. Polynuclear aromatic hydrocarbons and diketones. Solvent and structural influences on absorption maxima, stereochemical factors. Cis-trans isomers, and cross conjugation. Beer's law application to mixture analysis and dissociation constant of a weak acid. Charge transfer spectra of complexes, photometric titrations

ASP 04: NMR spectroscopy-I (^{1}H NMR): **(15Hrs)**

^{1}H NMR spectroscopy: Magnetic properties of nuclei, Principles of NMR. Instrumentation, CW and pulsed FT instrumentation, relaxation phenomenon, spin-spin and spin-lattice relaxations, equivalent and non equivalent protons, enantiotopic and diastereotopic protons, Chemical shifts, factors affecting the chemical shifts, electronegativity and anisotropy, shielding and deshielding effects, Signal integration, Spin-spin coupling: vicinal,germinal and long range, Coupling constants and factors affecting coupling constants. NMR spectra of ethyl alcohol, vinyl chloride, acetophenone, mono-substituted benzenes, anisole, benzaldehyde, ethyl-benzene, p-chloro aniline and benzoic acid. Applications of ^{1}H NMR spectroscopy: hydrogen bonding, proton exchange processes (alcohols, amines and carboxylic acids), cis-trans isomers, conformational analysis, deuterium exchange reactions

References:

1. Fundamentals of Molecular Spectroscopy, Banwell and McCash.
2. Molecular Structure and Spectroscopy, G.Aruldas
3. Introduction to Molecular Spectroscopy, G.M. Barrow.
4. Introduction to Spectroscopy, Pavia, Lampman, Kriz and Vyvyan.
5. Absorption Spectroscopy of Organic Compounds, J.R. Dyer.
6. Biochemistry: Hames and Hooper.
7. Pharmaceutical analysis, Watson
8. NMR in Chemistry- A multinuclear introduction, William Kemp.
9. Organic Spectroscopy, William Kemp.
10. Spectroscopy of organic compounds, P.S. Kalsi.
11. Structural methods n Inorganic chemistry, E.A.V Ebsworth.
12. Basic Principles of Spectroscopy, Raymond Chang.

Paper-V CH 101P: Inorganic Chemistry Practicals: 6 hrs/week

1. a) Determination of total, Permanent and temporary hardness of water
   b) Back titration of Ni^{+2} by EDTA
   c) Back titration of Al^{+3} by EDTA
   d) Substitution titration of Ca^{+2} by EDTA

2. Preparation of the following complexes and their characterization by metal estimation and conductance measurement.

   a) $[Cu(NH_3)_4]SO_4$ b) $[Hg[Co(SCN)_4$ c) $[K_3[Fe(C_2O_4)_3]$
   d) $[Ni(en)_3S_2O_3]$ e) $[Co(NH_3)_5Cl]Cl_2$ f) $[Mn(acac)_3]$

References:

1. Text book of Quantitative Inorganic Analysis by A.I.Vogel, 3rd edition, ELBS 1969.
2. Vogel's text book of Quantitative Inorganic analysis. Jeffery etal, 4th edition, ELBS 1988.
3. Vogel's text book of Quantitative Inorganic Analysis. 6 th edition, Pearson education Ltd. 2002.
4. Practical Inorganic chemistry By G.Marr and R.W.Rockett 1972.
5. Experimental Inorganic/Physical Chemistry – An Investigative integrated approach to Practical Project work. By Mounir A.Malati, 1999.
6. Advanced experimental Inorganic chemistry by. Ayodhya Singh.
7. Practical Inorganic Chemistry by G.Pass & H. Sutchiffe, 2nd edn John Wiley &Sons.

Paper-VI CH 102P: Organic Chemistry Practicals: 6 hrs/week

Synthesis of following Compounds (Purification – Recrystalisation calculation of yield)

1. 2,4,6-TriBromo Aniline
2. 1,3,5-TriBromo Benzene
3. Para bromo acetanilide
4. Para bromo Aniline
5. Pthalimide
6. M-dinitro benzene
7. Tetra Hydro Carbazole
8. 7- Hydroxy 4-Methyl Coumarin
9. 2, 4-di Hydroxy Acetphenone
10. Diels alder adduct – Anthracene maleic anhydride adduct

References:

1. Text book of practical organic chemistry, Vogel
2. Text book of practical organic chemistry, Mann and Saunders.

Paper-VII 103P Physical Chemistry Practicals: 6 hrs / week

Physical properties: Determination of density and viscosity of liquids

Distribution:

- Distribution of acetic acid between n-butanol and water
- Distribution of iodine between CCl_4 and water

Chemical kinetics:

- Acid-catalyzed hydrolysis of methyl acetate
- Peroxydisulphate- I^- reaction (overall order)

Conductometry:

- Titration of strong acid vs strong base
- Titration of weak acid vs strong base
- Determination of cell constant
- Determination of dissociation constant of a weak acid

Potentiometry:

- Titration of strong acid vs strong base
- Titration of weak acid vs strong base
- Determination of dissociation constant of a weak acid
- Determination of single electrode potential

Polarimetry:

- Determination of specific rotation of sucrose
- Acid-catalyzed hydrolysis of sucrose (inversion of sucrose)

Adsorption and others:

- Adsorption of acetic acid on animal charcoal or silica gel
- Determination of critical solution temperature of phenol-water system

References:

1) Practical Physical Chemistry by A. Findlay, Longman – London.
2) Practical Physical Chemistry by B. Vishwanathan and P.S. Raghavan. Viva Books Pvt.Ltd., Hyderabad.
3) Practical Physical Chemistry by B.D. Kosla and V.C. Gard, R.Chand or Co. Delhi.
4) Systematic experimental physical chemistry by S.W. RajBhoj and Dr.T.K. Chondhekar, Anjali Publications, Aurangabad.

SEMESTER –II

Paper-I: CH 201T (INORGANIC CHEMISTRY-II)

IC 05: Reaction mechanisms of transition metalcomplexes
IC 06: Bonding in metal complexes-II
IC 07: Metal clusters
IC 08: Biocoordination chemistry

IC-05: Reaction mechanisms of transition metal complexes: (15Hrs)

Ligand substitution reactions:
Energy profile of a reaction – Transition state or Activated Complex. Types of substitution reactions (SE,SN,SN^1,SN^2).
Ligand substitution reactions in octahedral complexes:
Aquation or Acid hydrolysis reactions, Factors effecting Acid Hydrolysis , Base Hydrolysis, Conjugate Base Mechanism, Evidences in favour of SN^1CB Mechanism.
Annation reactions.
Substitution reactions with out Breaking Metal-Ligand bond.
Ligand Substitution reactions in Square-Planar complexes: Mechanism of Substitution in Square-Planar complexes- Trans-effect, Grienberg's Polarization theory and π - bonding theory – Applications of Trans-effect in synthesis of Pt (II) complexes.
Electron Transfer Reactions (or Oxidation-Reduction Reactions) in Coordination compounds: Mechanism of One-electron Transfer Reactions: Atom (or group) Transfer or Inner Sphere Mechanism, Direct electron Transfer or Outer Sphere Mechanism.Marcus –Hush theory.

IC-06: Bonding in Metal Complexes – II: (15Hrs)

Free ion terms and Energy levels: Configurations,Terms,States and Microstates – Formula for the calculation of Microstates p^n and d^n configurations – L-S (Russel-Saunders) coupling scheme – j-j coupling scheme – Determination of terms for various p^n and d^n configurations of metal ins. Hole formalism – Energy ordering of terms (Hund's rules) Inter – electron repulsion Parameters (Racah parameters) – Spin-Orbital coupling parameters. Effect of weak cubic crystal fields on S,P,D and F terms-Orgel Diagrams.Jahn –Tellor theorem and its effects on terms.

IC-07: Metal Clusters: (15Hrs)

Carbonyl clusters: Factors favouring Metal-Metal bonding – Classification of Clusters –
Low Nuclearity Clusters : M_3 and M_4 clusters , structural patterns in $M_3(CO)_{12}$ (M=Fe,Ru,Os) and $M_4(CO)_{12}$ (M=Co,Rh,Ir) Clusters-. Metal carbonyl scrambling – High Nuclearity clusters M_5,M_6,M_7,M_8 and M_{10} Clusters-, Polyhedral skeletal electron pair theory and Total Electron Count theory – Wades rules – Capping rule – Structural patterns in
$[Os_6(CO)_{18}]^{2-}$, $[Rh_6(CO)_{16}]$, $[Os_7(CO)_{21}]$, $[Rh_7(CO)_{16}]^{3-}$, $[Os_8(CO)_{22}]^{2-}$, $[Os_{10}C(CO)_{24}]^{2-}$ and $[Ni_5(CO)_{12}]^{2-}$.
Metal Halide clusters: Major structural types in Dinuclear Metal-Metal systems – Edge sharing Bioctahedra,Face sharing Bioctahedra,Tetragonal prismatic and Trigonal antiprismatic structures -. Structure and bonding in $[Re_2Cl_8]^{2-}$ and Octahedral halides of $[Mo_6(Cl)_8]^{4+}$ and $[Nb_6(Cl)_{12}]^{2+}$. Trinuclear halides of Re(III).Hoffman's Isolobal analogy and its Structural implications.

IC-08: Bio Coordination Chemistry: (15Hrs)

Metal ions in Biological systems: Brief survey of metal ions in biological systems. Effect of metal ion concentration and its physiological effects. Basic principles in the biological selection of elements.

Oxygen transport and storage: Hemoglobin and Myoglobin: Geometric, electronic and magnetic aspects of Dioxygen binding, Oxygen adsorption isotherms and cooperativity in Hemoglobin and its physiological significance. Role of globin chain. Hemerythrin and Hemocyanin: Structure of deoxy forms, oxygen binding, Geometric, electronic and magnetic aspects. Comparison of Hemerythrin and Hemocyanin with hemoglobin.

Photosynthesis: Structural aspects of Chlorophyll. Photo system I and Photo system II.

Vitamin B_6 model systems: Forms of vitamin B_6 with structures. Reaction mechanisms of (1) Transamination (2) Decarboxylation and (3) Dealdolation in presence of metal ions.

References:

1. Inorganic Reaction Mechanisms. M.L.Tobe and John Burgess, Addison Wesley Longman (1999).
2. Metal ions in Reaction Mechanisms. K.Veera Reddy. Golgotia Publications (P) Ltd
3. Mechanisms of Reactions in Transition Metal Sites. Richard A Henderson, Oxford Science Publications, London (1993).
4. Inorganic Reaction Mechanisms, F.Basolo and R.G.Pearson, New York (1967).
5. Advanced Inorganic Chemistry. F.A.Cotton, G.Wilkinson, C.A.Murillo and M.Bochmann, 6 Th Edition, Wiley Interscience, N.Y (1999
6. Inorganic Chemistry, J.E.Huheey , K.A.Keiter and R.L.Keiter 4 th Edition Harper Cottens College Publications (1993).
7. Inorganic Biochemistry Edited by G.L.Eichorn, Volume 1 Elsevier (1982).
8. The Chemistry of Metal Cluster Complexes. D.F.Shriver, H.D.Kaerz and R.D.Adams (Eds), VCH, NY (1990).
9. Inorganic Chemistry, Keith F.Purcell and John C.Kotz, Holt-Saunders International Editions, London (1977).
10. Bioinorganic Chemistry, I.Bertini, H.B.Gray, S.J.Lippard and S.J.Valentine, Viva Low-Priced Student Edition, New Delhi (1998).
11. Bioinorganic Chemistry: Inorganic Elements in the Chemistry of Life, W.Kain and B.Schwederski, John Wiley and Sons, NY (1999).
12. Bioorganic Chemistry – Dugas.

Paper – II: CH202T (Organic Chemistry-II)

OC05: Conformational Analysis
OC06: Reaction Mechanism
OC07: Reactions and Rearrangements
OC08: Natural Products

OC05: Conformational Analysis: **(15Hrs)**

Introduction to conformational isomerism, concept of dynamic stereochemistry, study of conformations of ethane, butane and 1,2 di halo butanes halo hydrins and vicinaldiols Klyne prelog terminology for conformers and torsion angels. Conformations of unsaturated acyclic compounds Factors affecting stability of conformations, use of physical and spectral methods in determining preferred conformations. Conformations relative stability and reactivity of acyclic diasteriomers. Steric and stereo electronic factors examples. Conformation and reactivity winstein Holness equation Curtin Hamett Principle. Stereo Chemistry of additions, eliminations, neighboring group participation & intra molecular rearrangements.

OC06: Reaction Mechanism: **(15Hrs)**

Nucleophilic aromatic substitution:- Aromatic nucleophilic substitution SN^1 (Ar), SN^2 (Ar) and benzyne mechanisms. Definition and types of ambident nucleophiles.

Neighbouring group participation:- Criteria for determining participation of neighnbouring group, Enhanced reaction rates, retention of configuration, isotoping labeling and cyclic intermediates. Neighboring groups participation involving Halogens, oxygen, nitrogen, aryl groups, σ and π bonds. Introduction to non classical carbocations.

Elimination reactions:- Elimination reactions E2, E1, E1CB mechanism, orientation and stereo selectivity in E2 elimination Pyrolytic Syn elimination, elimination Vs Substitution.

OC07: Reactions and Rearrangements: **(15Hrs)**

Selective organic name reactions:- Mannich reaction, Michael addition, Chichibabin reaction, Shapiro reation Barton reaction.

Molecular Rearrangement:- 1) Molecular rearrangements involving electron deficient carbon wagner merwein rearrangement, Pinacol- pinacalone rearrangement. 2) Electron deficient nitrogen- Hoffman, Curtious, Beckmann rearrangements.

3) Electron deficient oxygen**:-** Baeyer villiger oxidation. Base catalysed rearrangements favorski rearrangement, Benzilic acid, Fries rearrangements.

OC08: Natural Products: **(15Hrs)**

Importance of Natural products as drugs. Isolation of natural products by steam distillation, solvent extraction and chemical methods. General methods in structure determination of terpenes. Isoprene rule structure determination and synthesis of α-terpineol, citral and camphor.

Alkaloids: Definition and classification, general chemical methods used in structure determination of alkaloids. Isolation structure determination and synthesis of Atropine, Quinine, Papaverine, Nicotine.

References:

1. Reaction Mechanisms – Jerry March
2. A Guide Book to Reaction Mechanisms in Organic Chemistry-peter Sykes
3. Terpenoids- Mayo
4. Stereochemistry of carbon compounds –Principles and Applications by D.Nasipuri
5. Stereochemistry by V M Potapov
6. Advanced Organic Chemistry by Jerry March
7. Mechanism and Structure in Organic Chemistry S.Mukerjee
8. Alkaloids by K.W.Bentley
9. Organic Reaction mechanisms – Mukherji & Singh
10. Organic Chemistry Volume –I – I.L.Finar

Paper-III: CH 203T (PHYSICAL CHEMISTRY-II)

PC-05: Thermodynamics-II
PC-06: Photochemistry-I
PC-07: Quantum Chemistry-II
PC-08: Solid state chemistry

PC-05:Thermodynamics-II: **(15Hrs)**

Solutions: Specifiying the Solution composition. Partial molar poperties-significance. Relation between solution volume and partial molar volume. Measurement of partial molar volumes- slope and intercept methods. The chemical potential. Variation of chemical potential with T and P. Gibbs-Duhem equation-derivation and significance

Ideal solutions. Thermodynamic properties of ideal solutions. Mixing quantities. Vapour pressure-Raoult's law. Thermodynamic properties of ideally dilute solutions. Vapour pressure- Henry's law.

Nonideal systems. Concept of fugacity, fugacity coefficeient. Determination of fugacity. Non ideal solutions. Activities and activity coefficients. Standard-state conventions for non ideal solutions. Determination of activity coefficients from vapour pressure measurements. Activity coefficients of nonvolatile solutes using Gibbs-Duhem equation.

PC-06:Photochemistry-I: **(15Hrs)**

Electronic transitions in molecules. The Franck Condon principle. Electronically excited molecules- singlet and triplet states. Radiative life times of excited states-theoretical treatment. Measured lifetimes. Quantum yield and its determination. Actinomety-ferrioxalate and uranyl oxalate actinometers-problems.

Derivation of fluorescence and phosphorescence quantum yields. E-type delayed fluorescence- evaluation of triplet energy splitting(ΔE_{ST}). Photophysical processes-photophysical kinetics of unimolecular reactions. Calculation of rate constants of various photophysical processes-problems, State diagrams

Photochemical primary processes. Types of photochemical reactions- electron transfer, photodissociation, addition, abstraction, oxidation and isomerization reactions with examples. Effect of light intensity on the rates of photochemical reactions. Photosensitization. Quenching-Stern Volmer equation. Experimental set up of a photochemical reaction. Introduction to fast reactions- Principle of flash photolysis.

PC-07: Quantum chemistry-II **(15Hrs)**

Particle in a box- application of the schrodinger wave equation to particle in a one dimensional and three dimensional. Plots of ψ and ψ^2-discussion. Degeneracy of energy levels. Comparison of classical and quantum mechanical particles. Calculations using wave functions of the particle in a box-orthoganality, measurability of energy, position and momentum, average values and probabilities. Application to the spectra of conjugated molecules.

Cartesian, Polar and spherical polar coordinates and their interrelations

Schrodinger equation for the hydrogen atom- separation into three equations. Hydrogen like wave functions. Radial and angular functions. Quantum numbers n, l and m and their importance. The radial distribution functions. Hydrogen like orbitals and their representation. Polar plots, contour plots and boundary diagrams.

Bonding in molecules. Molecular orbital theory-basic ideas. Construction of MOs by LCAO, H_2^+ ion. The variationan integral for H_2^+ ion. Detailed calculation of Wave functions and energies for the bonding and antibonding MOs. Physical picture of bonding and antibonding wave functions. Energy diagram. The MO and VB wave functions for H_2 molecule and their comparision.

PC-08: Solid state chemistry: **(15Hrs)**

Magnetic properties of solids- classification of magnetic materials, Magnetic susceptibility, Langevin diamagnetism, Weiss theory of Para magnetism

Electronic properties of metals, insulators and semi conductors: Electronic structure of solids, Band theory, band structure of metals, insulators and semiconductors. Electrons, holes and Excitons. The temperature dependence of conductivity of extrinsic semi conductors. Photo conductivity and photovoltaic effect-p-n junctions.

Superconductivity. Occurrence of superconductivity. Destruction of superconductivity by magnetic fields-Meisner effect. Types of superconductors. Theories of super conductivity- BCS theory.
High temperature superconductors. Structure of defect perovskites. High T_c superconductivity in cuprates. Phase diagram of Y-Ba-Cu-O system. Crystal structure of $YBa_2Cu_3O_{7-x}$. Preparation of 1-2-3 materials. Origin of high T_c superconductivity.

References:

1. Atkin's Physical Chemistry, Peter Atkins and Julio de Paula, Oxford University press
2. Physical Chemistry, Ira N. Levine, McGraw Hill
3. Physical Chemistry-A Molecular approach, D.A. McQuarrie and J.D. Simon, Viva Books Pvt Ltd
4. Molecular Thermodynamics, D.A. McQuarrie and J.D. Simon, University Science Books
5. Quantum Chemistry, Ira N. Levine, Prentice Hall
6. Introduction to Quantum Chemistry, A.K. Chandra, Tata McGraw Hill
7. Introduction to Solids, Leonid V. Azaroff, Tata McGraw Hill
8. Solid state Chemistry, D.K. Chakrabarthy, New Age International
9. Solid state Chemistry and its aplications, A.R. West, Plenum.
10. Fundamentals of Photochemistry, K.K.Rohtagi-Mukherji, Wiley-Eastern
11. Molecular Photochemistry, N.J. Turro, Benjamin
12. Photochemistry, R.P.Kundall and A. Gilbert, Thomson Nelson
13. Essentials of Molecular Photochemistry by A. Gilbert and J. Baggott, Blackwell Scientific Publications.
14. Organic Photochemistry by J.M.Coxon and B.Halton, Cambridge University press.
15. Introductory Photochemistry by A.Cox and T.J.Kemp. McGraw-Hill, London.
16. Principles of the Solid State, H. V. Keer, New Age International

Paper-IV: CH 204T (ANALYTICAL TECHNIQUES AND SPECTROSCOPY-II)

ASP-05: Electro analytical Techniques
ASP-06: NMR- II
ASP-07: Mass Spectroscopy
ASP-08: Electron Spin Resonance (ESR)

ASP-05: Electro Analytical Techniques: **(15Hrs)**

a) Types and Classification of Electro analytical Methods.

i) Potentiometry- Types of electrodes, Hydrogen gas, Calomel, Quin hydrone and glass electrodes. Determination of pH. Potentiometric titrations.

ii) Conductometry – Definition of terms – conductivity, specific conductivity, cell constant. Mobility of ions, Conductometric titrations.

b) D.C Polarography :. Dropping mercury electrode- Instrumentation-polarogram. Types of Currents : Residual, Migration, Limiting. Two and Three electrode assemblies. Ilkovic equation (derivation not necessary) and its consequences. Types of limiting Currents : Adsorption, Diffusion, Kinetic. Applications of polarography in qualitative and quantitative analysis. Analysis of mixtures. Application to inorganic and organic compounds. Determination of stability constants of complexes.

c) Brief account of following techniques and their advantages over conventional d.c.polargraphy.

(i) A.C.polarography (ii) Square-wave polarography (iii) Pulse polarography (iv) Differential pulse polarography

d) Amperometric titrations :Principle, Instrumentation. Types and applications of amperometric titrations. Determination of SO_4^{2-}, metal ions viz., Mg^{2+}, Zn^{2+}, Cu^{2+} and other substances.

e) Cyclic Voltammetry : Principle, instrumentation, reversible and irreversible cyclic voltammograms. Applications. Cyclic voltammetric study of insecticide parathion.

ASP 06: : NMR -II: **(15Hrs)**

^{1}H NMR spectroscopy: First order and non first order spectra e.g., AX, AX_2, AX_3, A_2X_3, AMX and AB, ABC, Simplification of complex spectra: increased field strength, deuterium exchange, Lanthanide shift reagents and double resonance techniques. Discrimination of enantiomers by use of chiral NMR solvents (CSAs), chiral lanthanide shift reagents and Mosher's acid. Nuclear Overhauser Enhancement (NOE).

^{19}F NMR spectroscopy: ^{19}F chemical shifts, coupling constants. Applications of ^{19}F NMR involving coupling with ^{19}F,^{1}H and ^{31}P: 1,2 dichloro-1,1 difluoro ethane, BrF_5, SF_4, PF_5, ClF_3, IF_5, HF_2^-.

^{31}P NMR spectroscopy: ^{31}P chemical shifts, coupling constants. Applications of ^{31}P NMR involving coupling with ^{31}P , ^{19}F, ^{1}H and ^{13}C: ATP, Ph_3PSe, P_4S_3, $P(OCH_3)_3$, H_3PO_4, H_3PO_3, H_3PO_2, HPF_2, PF_6^-, PH_3,[Rh $(PPh_3)Cl_3$] Rh I=1/2

Introduction to solid state NMR: Magic angle spinning (MAS).Applications of solid state NMR.

ASP 07: Mass spectrometry: **(15Hrs)**

Origin of mass spectrum, principles of EI mass spectrometer. Types of fragments: odd electron and even electron containing neutral and charged species (even electron rule), Nitrogen rule, isotopic peaks, determination of molecular formula, metastable ion peaks. High resolution mass spectrometry. Salient features of fragmentation pattern of organic compounds including β-cleavage, Mclafferty rearrangement, retro Diels – Alder fragmentation and ortho effect. Principle of EI, CI, Fast Atom Bombardment (FAB),

Secondary Ion Mass Spectrometry (SIMS), Electrospray (ESI) ionization and Matrix Assisted Laser Desorption Ionization (MALDI) methods. Introduction to principle and applications of Gas Chromatography-Mass Spectrometry (GC-MS) and Liquid chromatography-Mass Spectrometry (LC-MS) techniques.

ASP-08: Electron Spin Resonance: **(15Hrs)**

Introduction, principle, instrumentation, selection rules, interpretation of Lande's factor 'g'. Hyperfine and super hyperfine Coupling. Anisotropy in 'g' values and hyperfine coupling constants. Zero field splitting, Kramer's degeneracy, quadrupolar interactions. Application of ESR to the study of simple free radicals: methyl (CH_3), ethyl(C_2H_5), 1,4-benzosemiquinone and naphthalene anion, amine $(NH_2)^{\cdot}$, diphenyl picryl hydrazyl, cyclopentadienyl $(C_5H_5)^{\cdot}$, hydroxy methyl$(CH_2OH)^{\cdot}$ radicals.

Study of free radicals and transition metal complexes. Applications of ESR to Metal Complexes - ESR Spectra of d^1-d^9 Transition Metal Complexes with examples. Interpretation of g in cubic , axial and rhombohedral geometries. Factors affecting g values. Calculation of g values with simple examples. Interpretation of 'g' and 'A' values from esr spectral data in- i) MnF_6^{4-}, ii) CoF_6^{4-}, and CrF_6^{3-}.

References:

1. Spectroscopic identification of organic compounds by R.M. Silverstein and F.X. Webster.
2. Organic spectroscopy by William Kemp
3. Mass Spectrometry for Chemists and biochemists by M. Rose and R.A. W. Johnstone
4. Spectroscopic methods in organic chemistry by D.H. Williams and I. Fleming
5. Practical Pharmaceutical Chemistry by A. H. Beckett and J.B. Stenlake
6. Biological Mass Spectrometry by A.L. Burlingame
7. Principles and Practice of Biological Mass Spectrometry by Chhabil Das
8. Spectrscopic identification of organic compounds by R.M.Silverstein. G.C.Bassler and T.E.Morrill
9. NMR-A multinuclear introduction by William Kemp
10. Stereochemistry of Carbon compounds by Ernest L Eliel / Samuel H. Wilen
11. Principles of Polarography, Heyrovsky.
12. Principles of Polarography, Kapoor.
13. Modern Electroanalytical methods, edited by C.Charlot, Elsevier Company.
14. Principles of Instyrumental analysis, Skoog, Holler and Nieman, Harcourt Asia PTE Ltd.
15. Analytical Chemistry-An Introduction, Skoog, West, Holler and Crouch, Saunders College Publishing.
16. Prinicples of Instrumental Analysis, Skoog and Leary, Saunders College Publishing.
17. International series of Monographs, Vol. **53**: Photoelectron Spectroscopy, Edited by D. Beckerand D. Betteridge 1972.
18. Sructural methods in inorganic chemistry, E.A.V. Ebsworth.

Paper-V CH 201P: Inorganic Chemistry Practicals: 6 hrs/week

I. Estimation:

1. Vitamin –C
2. Calcium in Milk
3. Chlorine in Bleaching Powder

II. Analysis of Binary Mixture:

1. Determination of CU^{2+} & Ni^{2+}
2. Determination of Fe & Al^{3+}
3. Determination of CU^{2+} & Zn^{2+}
4. Determination of Ca^{2+} & Mg^{2+}
5. Determination of Ferrocyanide & Ferricyanide

References:

1. Text book of Quantitative Inorganic Analysis by A.I.Vogel, 3rd edition, ELBS 1969.
2. Vogel's text book of Quantitative Inorganic analysis. Jeffery etal, 4th edition, ELBS 1988.
3. Vogel's text book of Quantitative Inorganic Analysis. 6 th edition, Pearson education Ltd. 2002.
4. Practical Inorganic chemistry By G.Marr and R.W.Rockett 1972.
5. Experimental Inorganic/Physical Chemistry – An Investigative integrated approach to Practical Project work. By Mounir A.Malati, 1999.
6. Advanced experimental Inorganic chemistry by. Ayodhya Singh.
7. Practical Inorganic Chemistry by G.Pass & H. Sutchiffe, 2nd edn John Wiley &Sons.

Paper-VI CH 202P : Organic Chemistry Practicals: 6 hrs / week

Identification of organic compounds, systematic qualitative analysis:
Physical data BP / MP, Ignition test, Lassaigne test – Nitrogen, Sulphur and halogens, solubility classification
Functional groups tests, Preparation of crystalline derivative and determination of their m.p.s and reference to literature to identify the compounds
A minimum of **14** compounds covering different functional groups and solubility pattern.
Glucose, benzoic acid, 2-chloro benzoic acid, anisic acid, p-nitrobenzoic acid; p-cresol, p-chlorophenol,

β-naphthol; aniline, o/m/p-chloroanilines; N-methylaniline/N-ethylaniline, N,N-dimethylaniline,

benzamide, acetanilide, benzaldehyde, anisaldehyde, acetophenone, benzophenone, ethylbenzoate, methylbenzoate, nitrobenzene, chlorobenzene, bromobenzene , naphthalene, biphenyl and anthracene.

Identification of unknown organic compounds from their IR, UV, ^{1}H NMR and Mass Spectral data:
Analysis of recorded spectra of compounds belonging to i)alkynes, ii) alcohols and phenols iii) aldehydes and ketones iv)carboxylic acids,v) esters vi) acid amides and vii) primary and secondary amines.

References:

1. Text book of practical organic chemistry, Vogel
2. Text book of practical organic chemistry, Mann and Saunders.
3. Spectral identification of organic compounds Bassler, Silverstein 5th Edition

Paper-VII CH 203P : Physical Chemistry Practicals: 6 hrs /week

Distribution:

1) Distribution of I_2 between CCl_4 and aq.KI solution- calculation of equilibrium constant.
2) Study of complex formation between ammonia and metal ion

Chemical Kinetics

1) Stoichiometry of peroxydisulphide- iodide reaction
2) Peroxydisulphide- iodide reaction: order w.r.t [I-] by isolation method
3) Peroxydisulphide- iodide reaction: order w.r.t [$S_2O_8^{2-}$] by initial rate method

Condutometry:

1) Titration of a mixture of strong and weak acids vs strong base
2) Determination of the hydrolysis constant of aniline hydrochloride
3) Determination of solubility product

Potentiometry:

1) Titration of Fe^{+2} vs $Cr_2O_7^{-2}$ (redox titration)
2) Titration of Cl^- vs Ag+ (precipitation titration)
3) Determination of solubility product

Colorimetry:

1) Verification of Beer's law and calculation of molar absorption coefficient using $CuSO_4$ and $KMnO_4$ solutions
2) Mixture Analysis

pH metry:

1) Calibration of a pH meter and measurement of pH of different solutions
2) Preparation of phosphate buffers
3) Determination of pKa of weak acid

References:

1) Practical Physical Chemistry by A. Findlay, Longman – London.
2) Practical Physical Chemistry by B. Vishwanathan and P.S. Raghavan. Viva Books Pvt.Ltd., Hyderabad.
3) Practical Physical Chemistry by B.D. Kosla and V.C. Gard, R.Chand or Co. Delhi.
4) Systematic experimental physical chemistry by S.W. RajBhoj and Dr.T.K. Chondhekar, Anjali Publications, Aurangabad.