COURSE CODE: 6SMCH101

INORGANIC CHEMISTRY - I

COURSE OBJECTIVES :-

The student will be able to
1. Explain rules of periodicity
2.Identify s,p,d,f block elements
3.Provide brief descriptions of the transition elements
4. Understand Chemical Bonding and structure
5. Explain Bioinorganic Chemistry
6. Analvze Character of covalent bonds.

Syllabus:

UNIT - I Chemical periodicity Periodic table, group trends and periodic trends in physical properties. Classification of elements on the basis of electronic, configuration. Modem IUPAC Periodic table. General characteristic of s, p, d and f block elements. Position of hydrogen and noble gases in the periodic table. Effective nuclear charges, screening effects, Slater's rules, atomic radii, ionic radii (Pauling's univalent), covalent radii. Ionization potential, electron affinity and electronegativity (Pauling's, Mulliken's and Allred-Rochow's scales) and factors influencing these properties. Inert pair effect. Group trends and periodic trends in these properties in respect of s-, p- and d-block elements.

UNIT – II Stereochemistry and Bonding in main group compounds (10+2) VSEPR theory &drawbacks, Walsh diagram (tri and penta atomic molecules dπ-pπ bonds, Bent rule, and energetic of hybridization, some simple reactions of covalently bonded molecules.

UNIT - III Chemistry of transition elements (10+2) General characteristic properties of transition elements, co-ordination chemistry Of transition metal ions, stereochemistry of coordination compounds, ligand field Theory, splitting of d orbital's in low symmetry environments, John-Teller effect, Interpretation of electronic spectra including charge transfer spectra, Spectrochemical series, nephelauxetic series, metal clusters, sandwich compounds, metal carbonyls.

UNIT - IV: Bioinorganic Chemistry (10+2) Role of metal ions in biological processes, structure and properties of metalloproteinase in electron transport processes, cytochromes, ferrodoxins and iorn sulphur proteins, ion transport across membranes, Biological nitrogen fixation, PSI ,PS – II, Oxygen uptake proteins.

UNIT - V: Chemical Bonding and structure Ionic bonding: Size effects, radius ratio rules and their limitations. Packing of ions in crystals, lattice energy, Bom-lande equation and its applications, Born-Haber cycle and its applications. Solvation energy, polarizing power and polarizability, ionic potential, Fazan's rules. Defects in solids (elememtary idea). Covalent bonding: Lewis structures, formal charge. Valence Bond Theory, directiqnal character of covalent bonds, hybridizations, equivalent and non-equivalent hybrid orbitals, Bent's rule, shapes of molecules and ions containing lone pairs and bond pairs (examples from main groups chemistry), Partial ionic Character of covalent bonds, bond moment, dipole moment and electro negativity differences. Concept of resonance, resonance energy, resonance structures

COURSE OUTCOMES:-

1.Be able to describe the electronic structure of atoms
2.Be able to know the properties of elements in the periodic table
3.Be able to differentiate between types of bonds& structures
4.Be able to determine shapes of molecules
5.Knowledge of properties and behavior of molecule

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COURSE CODE: 6SMCH102

Organic Chemistry-I

COURSE OBJECTIVES :-

The student will be able to
1. Explain rules of organic Reaction Mechanism
2.Identify Carbon–Carbon Multiple Bonds
3.Provide brief descriptions of the Elimination Reactions
4. Understand Stereochemistry & their rules
5. Explain Concept of Chirality
6. Analyze Characteristics of symmetry.

Syllabus:

UNIT - I Reaction Mechanism: Structure and Reactivity (10+2) Types of reactions, potential energy diagrams, transition states and intermediates.Hard and soft acids and bases, strength of acids and bases. Generation, structure,stability and reactivity of carbocations and carbanions.
b) Aliphatic Nucleophilic substitutions: The SN2, SN1 reactions with respects to mechanism and stereochemistry.Reactivity effect of substrate structure, effect of attacking nucleophiles, leaving groups and reaction medium, Neighbouring Group Participation. Nucleophilic aromatic substitutionreactions SN1, SN2.

UNIT – II Aromatic Electrophilic Substitutions: (10+2) Introduction, Concept of Aromaticity, the arenium ion mechanism, orientation and reactivity in Nitration, Sulphonation, Friedel-Crafts and Halogenation in aromatic systems, energy profile diagrams. The ortho/para ratio, ipso attack, orientation in their ring systems. Diazo-coupling, Vilsmeir reaction, Gatterman-Koch rection, Von Richter rearrangement .

UNIT - III Addition to Carbon–Carbon Multiple Bonds (10+2) Mechanism and steriochemical aspects of the addition reactions involving electrophiles and free radicals, regio and chemo-selectivity, orientation and reactivity. Hydrogenation of double and triple bonds, hydrogenation of aromatic rings. Michael reaction.

UNIT - IV Elimination Reactions: (10+2) The E1, E2 and E1cB mechanisms. Orientation in Elimination reactions. Reactivity: effects of substrate structures, attacking base the leaving group the nature of medium on elimination reactions. Pyrolytic elimination reactions.

UNIT - V

Study of following reactions: (10+2) Beckman, Fries, Benzilic acid, Hoffman, Schmidt, Curtius, Lossen & Benzilic acid,
Stereochemistry: (8)
Concept of Chirality and molecular dissymmetry, Recognition of symmetry elements and chiral centers, Prochiral relationship, homotopic, enantiotopic and disteriotopic groups and faces. Recemic modifications and their resolution, R and S nomenclature. Geometrical isomerism E and Z. Nomenclature. Conformational analysis : cyclohexane derivatives, stability and reactivity,

COURSE OUTCOMES:-

1.Be able to describe the transition states and intermediates
2.Be able to know the properties of Aromatic Electrophilic Substitutions
3.Be able to differentiate organic reactions
4.Be able to determine molecular Chirality
5.Knowledge of properties of Carbon–Carbon Multiple Bonds.

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COURSE CODE: 6SMCH103

PHYSICAL CHEMISTRY-I

COURSE OBJECTIVES :-

The student will be able to
1. Explain rules of THERMODYNAMICS
2.Identify Ideal & Non ideal solutions
3.Provide brief descriptions of the KINETIC THEORY OF GASES
4. Understand Molecular statistics
5. Explain Concept of Molecular collision in gases
6. Analyze Characteristics COLLOIDS AND MACROMOLECULES
7. Define phase rules.

Syllabus:

UNIT - I Thermodynamics-I (10+2)

1. Introduction, revision of basic concepts.
2. Second law of thermodynamics: Physical significance of entropy (Direction of spontaneous change and dispersal of energy), Carnot cycle, efficiency of heat engine, coefficient of performance of heat engine, refrigeration and problems.
3. Maxwell relations, thermodynamic equation of state, chemical potential, variation of chemical potential with temperature & pressure. Applications of chemical potential, phase rule, lowering of vapor pressure (Rault's law) and elevation in boiling point.

UNIT – II Thermodynamics-II (10+2)

1. Ideal solutions, Rault's law, Duhem-Margules equation and its applications to vaporpressure curves(Binary liquid mixture), determination of activity coefficients fromvapor pressure measurements, Henry's law.
2. Nonideal solutions : deviations from ideal behaviour of liquid mixtures, liquidvapor compositions, conditions for maximum.

UNIT - III Kinetic Theory Of Gases (10+2)

1. Postulates of kinetic theory of gases, P-V-T relations for an ideal gas, non-idealbehavior of gases, equation of state, compressibility factor, virial equation, van derWaal's equation, excluded volume and molecular diameter, relations of van derWaal's constants with virial coefficients and Boyle temperature.
2. Molecular statistics, distribution of molecular states, deviations of Boltzmann
law for molecular distribution, translational partition function, Maxwell-Boltzmann law for distribution of molecular velocities, physical significance of the distribution law, deviation of expressions for average, root mean square and most probable velocities, experimental verification of the distribution law.
3. Molecular collision in gases, mean free path, collision diameter and collision number in a gas and in a mixture of gases, kinetic theory of viscosity and diffusion.

UNIT - IV Colloids And Macromolecules(10+2)

1. Sols, Lyophilic and lyophobic sols, properties of sols, coagulation. Sols of surface active reagents, surface tension and surfactants, critical micelle concentration.
Macromolecules: Mechanism of polymerization, molecular weight of a polymer (Number and mass average) viscosity average molecular weight, numerical problems. Degree of polymerization and
molecular weight, methods of determining molecular weights(Osmometry, viscometry, light scattering, diffusion and ultracentrifugation) 05
3. Chemistry of polymerization: Free radical polymerization(Initiation, propagation and termination), kinetics of free radical polymerization, step growth polymerization(Polycondensation), kinetics of step polymerization, cationic and anionic polymerization.
(More stress should be given to solving numerical problems)

UNIT – V Phase rule(10+2)

Distribution Law: Partition of iodine between water and carbon tetrachloride. Equilibrium constant of I- + I2 □ I3-. Concentration of unknown potassium iodide. Partition of ammonia between water and chloroform. Partition of aniline between benzene and water. Hydrolysis constant of aniline hydrochloride. Association of benzoic acid in Naphthalene.
Solid-Liquid Equlibria: Construction of phase diagrams of simple eutectics, systems with congruent melting points and solid solutions. Determination of composition of unknown mixtures. Analytical and synthetic methods for the determination of solubilities

COURSE OUTCOMES:-

1.Be able to describe the Phase rule & Solid-Liquid Equlibria
2.Be able to know the properties of COLLOIDS AND MACROMOLECULES
3.Be able to differentiate polymerisation
4.Be able to determine Postulates of kinetic theory of gases
5.Knowledge of Chemistry of polymerization
6.Know methods of determining molecular weights.
7.Be able to understand kinetics of gases.

COURSE CODE: 6SMCH104

Analytical Chemistry-I

COURSE OBJECTIVES :-

The student will be able to
1. Determine Errors and treatment of Analytical Chemistry
2.Learn Chromatographic methods
3.Provide brief descriptions of Electro analytical Techniques
4. Understand Volumetric and Gravimetric Analysis
5. Explain Concept of TLC
6. Analyze Characteristics of Standard solutions Indicators
7. Define organic precipitation.

Syllabus:

UNIT – I Errors and treatment of Analytical Chemistry (10+2)

Errors, Determinant, constant and indeterminate. Accuracy and precision Distribution of random errors. Average derivation and standard derivation, variance and confidance limit. Significance figures and computation rules. Least square method. Methods of sampling: samples size. Techniques of sampling of
gases, fluid, solids, and particulates.

UNIT – II Chromatographic methods: (10+2)

General principle, classification of chromatographic methods. Nature of partition forces. Chromatographic behavior of solutes. Column efficiency and resolution.
Gas Chromatography: detector, optimization of experimental conditions. Ion exchanges chromatography. Thin layer chromatography: coating of materials, prepative TLC. Solvents used and methods of detection Column chromatography. Adsorption and partition methods. Nature of column materials.Preparation of the column. Solvent systems and detection methods.

UNIT - III Electroanalytical Techniques(10+2)

Polarography: Introduction, Instrumentation, Ilkovic equation and its verification. Derivation of wave equation, Determination of half wave potential, qualitative and quantitative applications. Amperometry: Basic principals, instrumentation, nature of titration curves, and analytical applications.

UNIT – IV Theory of Volumetric and Gravimetric Analysis(10+2)

Standard solutions Indicators, theory of indicators , types of titrations, Acid , base , precipitation, Redox and complexometric titrations, Acid–base titrations in nonaqueous media , solvent characterisation , living effect , applications of non –aqueous titrations , MnO_2 in pyrolusite, Na_2CO_3
+ $NaHCO_3$ and NaOH + Na_2CO_3 Mixture analysis , Gravimetric Analysis purity of the precipitate – Co precipitation's and post precipitations from homogenous solution , organic precipitation

UNIT – V Computer Science: (10+2)

Introduction: History etc. Hardware: Central processor unit. Input devices. Storage devices. Periferals, Software: Overview of the key elements of basic program structure, loops, arrays, mathematical function. User defined functions, conditional statements, string. Applications. Data representation, Computerized instruments system. Micro computer interfacing.

COURSE CODE: 6SMCH104

COURSE OUTCOMES :

1.Be able to describe use of Computer in analytical chemistry.
2.Be able to know the properties of Mixture and their analysis
3.Be able to differentiate Volumetric and Gravimetric Analysis
4.Be able to determine Solvent systems and their detection methods
5.Knowledge of Errors and their treatment
6.Know methods of sampling.

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COURSE CODE: 6SMCH105

LAB I:-

Inorganic Chemistry

1. Qualitative analysis of mixture containing.

Eight radical including some less common metal ions among the following by common method (preferably semi-micro method)

Basic radicals :- Ag, Pb, Hg, Cu, Cd,Bi, As, Sb, Sn, Fe, Al, Cr, Zn, Mn, Co, Ni, Ba, Sr, Ca, Mg, Na, K, NH4, Ce, Th, Zr, w, Te, Ti, Mo, O, V, Be, Li, Au, Pt,

Acid Radicals: - Co3, SO4, SO3, NO3, F, Cl, Br, I, NO2, BO3, C2O4, PO4, SiO4, Thiosulphate, Ferroeynide, Ferricyanide, Chromate, Arsenite, Arsenate, Permanganate,

2.Quantitative Analysis :

Involving two of the following in ores, alloys or mixture in solution – one by volumetric and other by gravimetric method Ag, Cu, Fe, Cr, Mn, Ni, Zn, Ba, Ca, Mg, chloride, Sulphate.

3.Estimation of :

Phosphoric acid in commercial orthophosphoric acid, Boric acid in borax, Ammonium lon in Ammonium salt, MnO2 in pyrolusite Available chlorine in bleaching powder,
H_2O_2 in commercial sample,

4.Preparations

Of selected Inorganic compounds and study of their properties by various method including IR, Electronic Spectra, Mossbaur, ESR, Spectra magnetic susceptibility etc.
$Vo(acac)_2$
Cis & Trans K [Cr (C2O4)2(H2O)$_2$]. 2H2O
$Na[cr(NH3)_2(SCN)_4]$
Mn (acac)
$K_3[Fe(C_2O_4)_3]$
Prussian Blue Turnbulls Blue
$[Co(NH_3)_6][Co(NO_2)_6]$
Hg [Co $(SCN)_4$]
[Ni $(NH_3)_4$] Cl_2
$Ni(DMG)_2$
$[Cu(NH3)_4]SO_4$
Mohr's salt
Nickel ammonium Sulphate

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COURSE CODE: 6SMCH106

LAB II:-

Physical Chemistry

Electrochemistry: **Conductometry**

1.Determination of solubility of sparingly soluble salt (e.g., PbSO4, BaSO4) conduct metrically.

2.Determination of the strength of strong and weak acids in a given mixture conduct metrically.

3.Determination of dissociation constant of weak electrolyte by conduct meter.

pH metry/Potentiometry

4.Determination of the strength of strong and weak acid in a given mixture using pH **5.**meter/potentiometer.

6.Determination of dissociation constant of weak acid by pH meter.

7.Determination of concentration of acid in given buffer solution by pH meter.

Polarimetry

8.Determination of rate constant for hydrolysis/inversion of sugar using polarimeter Solubility and partition coefficient

9.Effect of temperature on solubility of electrolyte: Determination of partition coefficient of between carbon tetrachloride and water.

Find out atomic parachor of carbon and hydrogen.

Colorimety

10. Verification of beer's and lamberts law and find out the concentration of unknown solution

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COURSE CODE: 6SMCH201

Inorganic Chemistry - II

COURSE OBJECTIVES :-

The student will be able to
1. Explain Chemistry of non – Transition elements
2.Define Organometallic chemistry principles
3.Know Metal – ligand equilibria in solution
4. Define applications of Lanthanides and Actinides
5. Explain Non- aqueous solvents
6. Understand Nuclear and radiochemistry.

Syllabus:

UNIT - I Chemistry of non – Transition elements (10+2)

General discussion on the properties of the non – transition elements, special features of individual elements, synthesis, properties and structure of halides and oxides of the non – transition elements, Polymorphism in carbon, phosphorous and sulphur, Synthesis, properties and structure of boranes, carboranes, silicates, carbides, phosphazenes, sulphur – nitrogen compounds, peroxo compounds of boron, carbon,sulphur, structure and bonding in oxyacids of nitrogen,phosphorous, sulphur and halogens, interhalogens, pseudohalides.

UNIT-II Organometallic Chemistry of transition elements (10+2)

Ligand hapticity, electron count for different types of organometallic compounds, 18 and 16 electron rule ,synthesis, structure and bonding,organometallic reagents in organic synthesis and in homogeneous catalytic reactions (Hydrogenation, hydroformylation, isomerisation and polymerisation), pi metal complexes,

) Metal – ligand equilibria in solution

Stepwise and overall formation constants and their interaction, trends in stepwise constants, factors affecting the stability of metal complexes with reference to nature of metal ion and ligand, chelate effect.

UNIT-III Studies and applications of Lanthanides and Actinides (10+2)

Spectral and magnetic properties, use of lanthanide compounds as shift reagents, Modern methods of separation of lanthanides and actinides, Organometallic chemistry applications of lanthanide and actinide compounds in Industries.

UNIT-IV Chemistry in Non- aqueous solvents (10+2)

Classification of solvents, properties, leveling effect, type reactions in solvents, chemistry of liquid ammonia, liquid dinitrogen tetraoxide and anhydrous sulphuric acid with respect to properties, solubilities and reactions.

UNIT-V Nuclear and radiochemistry (10+2)

Radioactive decay and equilibrium, nuclear reactions, Q value, cross-sections, types of reactions, chemical effects of nuclear transformation, fission and fusion, fission products and fission yield

COURSE OUTCOMES :-

1.Be able to describe properties of the non – transition elements
2.Be able to know the properties of Metal – ligand bonding
3.Be able to Know Nuclear and radiochemistry
4.Be able to define fission and fusion
5.Knowledge of Synthesis, properties and structure of ligand complexes.

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COURSE CODE: 6SMCH202

Organic Chemistry.-II

COURSE OBJECTIVES:

The student will be able to
1. Explain Mechanism of reactions
2.Define Alkylation and Acylation
3.Study of Organometallic compounds
4. Define Methodologies in organic synthesis
5. Explain carbonyl compounds

Syllabus:

UNIT – I Study of following reactions: (10+2)
Mechanism of condensation reaction involving enolates Mannich, Benzoin, Stobbe, Dieckmann, Diels-Alder, Robinson annulation Reimer-Tieman, Chichibabin, Baeyer Villiger oxidation

UNIT - II a) Alkylation and Acylation(10+2)
Introduction, Types of alkylation and alkylating agents: C-Alkylation and Acylation of active methylene compounds and Applications.
b) .Hrdroboration and Enamines : Mechanism and Synthetic Applications.

UNIT - III a) Reductions (10+2)
Study of following reductions- Catalytic hydrogenation using homogeneous and heterogeneous catalysts. Study of following reactions: Wolff-Kishner, Birch, Clemmensen, Sodium borohydride, Lithium Aluminium hydride (LAH) and Sodium in alcohol, Fe in HCl.
b) Oxidation
Application of following oxidizing agents: KMnO4, chromium trioxide, Manganese dioxide, Osmium tetraoxide, DDQ, Chloranil .

UNIT - IV a) Study of Organometallic compounds(10+2)
Organo-magnesium, Organo-zinc and Organo-lithium, Hg and Sn reagents; Use of lithium dialkyl cuprate their addition to carbonyl and unsaturated carbonyl compounds.

UNIT - V Methodologies in organic synthesis –(10+2)
ideas of synthones and retrones. Functional group transformations and interconversions of simple functionalities.

COURSE OUTCOMES:-

1.Be able to describe reaction involving enolates
2.Be able to know the properties ofAlkylation and Acylation reactions
3.Be able to Know Oxidation
4.Be able to define synthones and retrones
5.Be able to know carbonyl compounds.

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COURSE CODE: 6SMCH203

Physical Chemistry-II

COURSE OBJECTIVES :-

The student will be able to
1. Explain principles of PHOTOCHEMISTRY
2.Define Photo physical phenomenaI
3.Understand Arrhenius theory of electrolytic dissociation
4. Define kinetics of a reaction
5. Explain Experimental methods of reactions
6. Calculate order of a reaction
7. Know Electrochemical cells.

Syllabus:

UNIT – I Photochemistry (10+2)

Absorption of light and nature of electronic spectra, electronic transition, Frank-Condon principle, selection rules, photodissociation, predissociation, photochemical reactions: photoreduction, photooxidation, photodimerization, photochemical substitution, photoisomerization, photochemistry of environment: Green house effect.

UNIT - II Photo physical phenomenaI: (10+2)

Electronic structure of molecules, molecular orbital,
electronically excited singlet states, designation based on multiplicity rule, life time of electronically excited state, construction of Jablonski diagram, electronic transitions and intensity of absorption bands, photphysical pathways of excited molecular system(radiative and non-radiative).

UNIT - III Photo physical phenomena II(10+2)

Fluorescence, delayed fluorescence, and phosphorescence, fluorescence quenching: concentration quenching, fluorescence resonance enrgy transfer between photexcited donor and acceptor systems. Stern-Volmer relation, The Grotthus- Draper and lambert –Beer Law Stake-Einstain Law of photochemical Equivalence. Quantum yield of photochemical reactions. bimolecular collisional V quenching and Stern-Volmer equation.

UNIT-IV Electrochemistry(10+2)

1. Arrhenius theory of electrolytic dissociation (Evidences and limitations), revision of basic electrochemistry(Types of electrodes and cells).

2. Electrochemical cells with and without transference, determination of activity coefficients of an electrolyte, degree of dissociation of monobasic weak acid (approximate and accurate), instability constant of silver ammonia complex. Acid and alkaline storage batteries.

UNIT - V Chemical Kinetics(10+2)

Experimental methods of following kinetics of a reaction, chemical and physical (measurement of pressure, volume, EMF, conductance, diffusion current and absorbance) methods and examples. Order and methods of determination(Initial rate, Integration, graphical and half life methods), rate determining step, steady state approximation and study of reaction between NO2 and F2, decomposition of ozone, and nitrogen pentoxide. 08

Kinetics of complex reactions, Simultaneous (first order opposed by first order), Parallel and Consecutive reactions. Examples and numericals.

COURSE OUTCOMES :-

1.Be able to describe photodissociation
2.Be able to know photphysical pathways of excited molecular system
3.Be able to Know Electrochemical cells with and without transference

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COURSE CODE: 6SMCH204

ANALYTICAL CHEMISTRY-II

COURSE OBJECTIVES :-

The student will be able to
1. Explain principles of Ultraviolet and visible spectrophotometry
2.Define Infrared Spectroscopy
3.Understand Nuclear Magnetic Resonance (NMR)
4. Define Mass spectroscopy and their applications
5. Explain difference between AAS and FES
6. Learn principles & applications of various spectrophotometers

Syllabus:

UNIT - I a) Ultraviolet and visible spectrophotometry (UV-VIS) (10+2)
Introduction, Beer Lambert's law, instrumentation, calculation of absorption maxima of dienes, dienones and polyenes, applications.
b) Infrared Spectroscopy (IR)
Introduction, instrumentation, sampling technique, selection rules, types of bonds, absorption of common functional groups. Factors affecting frequencies,
applications.

UNIT - II Nuclear Magnetic Resonance (NMR) (10+2)
Magnetic and non magnetic nuclei, Larmor frequency, absorption of radio frequency. Instrumentation (FT-NMR). Sample preparation, chemical shift, anisotropic effect, spinspin coupling, coupling constant, applications to simple structural problems

UNIT - III Mass spectroscopy (10+2)
Principle, working of mass spectrometer (double beam). Formation of different types of ions, Mclafferty rearrangements, fragmentation of alkanes, alkyl aromatics, alcohols and ketones, simple applications, simple structural problems based on IR, UV , NMR and MS

UNIT – IV Nephlometry and Turbidometry (10+2)
Introduction, Theory, Instruments, working and Applications
b) Radiochemical Analysis, NAA: Scintillation counter and G.M. Counter (08)

UNIT – V Atomic Absorption Spectroscopy (10+2)
a) Introduction, Principal, difference between AAS and FES, Advantages of AAS over FES, advantages and disadvantages of AAS. Instrumentation, Single and double beam AAS, detection limit and sensitivity, Interferences applications.
b) Inductively coupled Plasma Spectroscopy Introduction, Nebulisation Torch, Plasmsa, Instrumentation, Interferences, Applications

COURSE OUTCOMES :-

1.Be able to describe Ultraviolet and visible spectrophotometry
2.Be able to know Infrared Spectroscopy
3.Be able to Know Nuclear Magnetic Resonance (NMR)
4.Be able to define Nephlometry and Turbidometry
5.Be able to know Inductively coupled Plasma Spectroscopy

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COURSE CODE: 6SMCH205

LAB I:-

Organic Chemistry
Quantitative Analysis

1.Determination of the percentage number of hydroxyl groups by acetylation method.
2.Estimation of amine/phenols using Bromate Bromide method of Acetylation method.
3.Estimation of Carbonyl group by hydrazone method.
4.Estimation of Glycine by titration.
5.Determination of equivalent weight of carboxylic compounds.Estimation of carboxyl group by titration/Silver salt method.

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COURSE CODE: 6SMCH206

LAB II:-

Analytical Chemistry

Study and identification of various organic compounds through…….

1. UV spectrophotometry
2. Nuclear Magnetic Resonance
3.Mass spectroscopy
4.Nephlometry and Turbidometry
5.Atomic Absorption Spectroscopy

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COURSE CODE: 6SMCH301

Application of Spectroscopy

COURSE OBJECTIVES :-

The student will be able to
1. Explain Symmetry and Group theory in Chemistry
2.Define Microwave Spectroscopy
3.Understand Infrared-Spectroscopy
4. Define Classical and quantum theories of Raman effect
5. Explain Basic principles of photo-electric effect
6. Learn principles & applications of various spectroscopies.

Syllabus:

UNIT – I Symmetry and Group theory in Chemistry:
Symmetry elements and symmetry operation, definition of group, subgroup. Conjugacy relation and classes. Point symmetry group. Schonfilies symbols, representations of groups by matrices (representation for the Cn, Cnv, Cnh, Dnh group to be worked out explicity). Character of a representation. The great orthogonality theorem (without proof) and its importance. Character tables and their use; spectroscopy. Derivation of character table for C2V and C3V point group Symmetry aspects of molecular vibrations of H2O molecule.

UNIT - II Microwave Spectroscopy:
Classification of molecules, rigid rotor model, effect of isotopic substitution on the transition frequencies, intensities, non-rigid rotor. Stark effect, nuclear and electron spin interaction and effect of external field, applications.

UNIT – III Infrared-Spectroscopy:
Review of linear harmonic oscillator, vibrational energies of diatomic molecules, zero point energy, force constant and bond strengths; anharmonicity, Morse potential energy diagram, vibration-rotation spectroscopy. P.Q.R. branches, Breakdown of Oppenheimer approximation; vibrations of polyatomic molecules. Selection rules, normal modes of vibration, group frequencies, overtones, hot bands, factors affecting the band positions and intensities, far IR region, metal ligand vibrations, normal co-ordinate analysis.

UNIT -IV Raman Spectroscopy:
Classical and quantum theories of Raman effect. Pure rotational, vibrational and vibrational-rotational Raman spectra, selection rules, mutual exclusion principle, Resonance Raman spectroscopy, coherent anti stokes Raman spectroscopy (CARS).

UNIT - V Molecular Spectroscopy:
Energy levels, molecular orbitals, vibronic transitions, vibrational progressions and geometry of the excited states, Franck-Condon principle, electronic spectra of polyatomic molecules. Emission spectra; radio-active and non-radioactive decay, internal conversion, spectra of transition metal complexes, charge-transfer spectra.
Photoelectron Spectroscopy:
Basic principles; photo-electric effect, ionization process, Koopman's theore

COURSE OUTCOMES:-

1.Be able to Calculate C2V and C3V point group
2.Be able to Draw representations of groups by matrices
3.Be able to Know rigid rotor models
4.Be able to define P.Q.R. branches
5.Be able to know Resonance Raman spectroscopy
6.Be able to define Emission spectra’s

PRACTICALS:-

1.Spectrophotometric determination (Instrumental methods and Analytical Technique**)**
Manganese/Chromium/Vanadium in steel sample.
Iron-salicylic acid complex by jobs method of continuous variation of concentration.
Zirconium-Alizarin red –s-complex; Mole ratio method.
Copper Ethylenediamine Complex; Slope ratio method.
Separation& determination of two metal ions: Cu- Ni, Zn-Ni,Mg-Ni involving volumetric & gravimetric method.
2.Studyand identification of various organic compound sthrough

COURSE CODE: 6SMCH302

Bio Organic &Inorganic Chemistry

COURSE OBJECTIVES :-

The student will be able to
1. Explain Cell Structure and Functions
2.Define Amino acids, Peptides and Proteins
3.Understand Nucleic Acids
4. Know Metals in Life Processes
5. Explain Basic principles of Trace Metals in Plant Life
6. Learn mechanism & applications of various enzymes.

Syllabus:

UNIT – I a) Cell Structure and Functions(10+2)
Structure of prokaryotic and eukaryotic cells, Intracellular organelles and their functions, comparison of plant and animal cells. Overview of metabolic processcatabolism and anabolism. ATP – the biological energy currency. Origin of life- unique properties of carbon, chemical evolution and rise of living system. Introduction to biomolecules, building blocks of bio-macromolecules.
b) Enzymes
Structure activity and reactions, catalyzed determination of active site, inhibition mechanism chemical transformations using enzyme.

UNIT - II Amino acids, Peptides and Proteins (10+2)
Chemical and enzymatic hydrolysis of proteins to peptides, amino acid sequencing.
Secondary structure of protein, forces responsible for holding of secondary structures. _-helix, _-sheets, super secondary structure, triple helix structure of collagen. Tertiary structure of protein- folding and domain structure. Quaternary structure.
Amino acid metabolism- degradation and biosynthesis of amino acids, sequence determination: chemical/ enzymatic/ mass spectral, racemisation/ detection. Chemistry of oxytocin and tryptophan releasing hormone (TRH).

UNIT – III Nucleic Acids (10+2)
[Purine and pyrimidine of nucleic acids, base pairing via H – bonding. Structure of ribonucleic acids (RNA) and deoxyribonucleic acid (DNA), double helix model of DNA and forces responsible for holding it. Chemical and enzymatic hydrolysis of nucleic acids. The chemical basis for heredity, an overview of replication of DNA, transcription, translation and genetic code. Chemical synthesis of mono and poly nucleosides.

UNIT – IV Metals in Life Processes (10+2)
Na+-K+-Pump charge carriers & osmotic pressure, relation to sensitivity of nerves and control on muscles, Mg-Ca complexes with nucleic acid, nerve impulse transmission, trigger reaction, Mn, Fe, Co, Cu, Mo, ferridoxins, Zn-super acid catalysis.

UNIT – V [A] Nitrogen Fixation (10+2)
Nitrogen in biosphere, nitrogen cycle, nitrification role of microorganisms, nitrogen fixation in soils
[B] Trace Metals in Plant Life
Micronutrients in soil, role of micronutrients in plant life

COURSE OUTCOMES:-

1.Be able to understand Trace Metals in Plant Life
2.Be able to Know nitrogen cycle
3.Be able to Know Metals in Life Processes
4.Be able to define Nucleic Acids
5.Be able to know Amino acid metabolism
6.Be able to define Cell Structure and Functions

COURSE CODE: 6SMCH303

Discipline Specific Elective -I
Applied Organic Chemistry

COURSE OBJECTIVES :-

The student will be able to
1. Explain Agrochemicals and their syntheis
2.Define Manufacture of Phenylethanol, detergents, vanillin and other food flavours, synthetic musk
3.Understand Dyes and Intermediates
4. Know Mechanism of polymerization
5. Explain Basic principles of Soap and detergents
6. Learn Starch and cellulose

Syllabus:

UNIT – I Agrochemical(10+2)

a. Carbamate pesticides: Introduction, carbaryl, Baygon, Aldicarb, Ziram, Zineb b. Organophosphorus pesticides: Malathion, monocrotophos, dimethoate, phorate, mevinphos
c. Natural and synthetic pyrethroids : Isolation and structures of natural allethrin, fenvalerate, cypermethrin,
d. Plant growth regulators: General survey synthesis of simple compounds
e. Insect repellents: General survey and synthesis
f. Jovenile harmone: introduction structures JHA importance synthesis
g. Pheromones: introduction, examples, and importance in IPM synthesis of juvabione bombycol, grandisol, and disparure

UNIT - II Manufacture of following(10+2)

2-Phenylethanol, detergents, vanillin and other food flavours, synthetic musk ,
Acetic acid and butenaldehyde from ethanol butyl acetate, furfural, from bagasse, citric acid from molasses, Application of oro and marker process. Nicotine from tobacco waste and citral from lemon grass, synthetic detergents, glycerol.

UNIT – III Dyes and Intermediates(10+2)

Synthesis of important dye intermediates. Commercial processes for Azo dyes, reactive dyes, optical brighteners, thermal sensitive dyes, dispenses dyes.

UNIT – IV Polymers(10+2)

Mechanism of polymerization. Study of polyesters, polyamides, PVC, polystyrene, polyvinyl acetate and polyvinylalcohol, polyethenes, viscose rayon, synthesis of polyethylene, polypropylene. Synthetic rubbers: Styrene-butadiene, butyl polyisoprene, phenol formation formaldehyde resin. Plastictisers and anti oxidants for polymers, Natural polymers: Starch and cellulose.

UNIT – V Soap and detergents(10+2)

Soap -Introduction, method of preparation of soap, types of soap, cleaning mechanism, limitation of soap as cleaning agent.
Detergents- Introduction , types of detergents, the mechanism of cleaning action of detergents,advantage of using detergent ,washing powder.

COURSE OUTCOMES :-

1.Be able to understand Soap and detergents
2.Be able to Know Polymers
3.Be able to Know Synthesis of dyes intermediates
4.Be able to define Manufacture of Acetic acid and butenaldehyde
5.Be able to know Plant growth regulators
6.Be able to define Jovenile harmones.
7.Be able to define azo dyes.

COURSE CODE: 6SMCH303

PRACTICALS:

ELECTIVE -ORGANIC CHEMISTRY

Lab - APPLIED ORGANIC CHEMISTRY

1. Manufacture of - 2-Phenylethanol, detergents, vanillin and other food flavours, synthetic musk
2. Determination of agrochemicals in plants.
3. Synthesis of polyethylene, polypropylene.
4. Synthetic rubbers: Styrene-butadiene, butyl polyisoprene, phenol formation formaldehyde resin
5. Preparation of soaps.

Recommended Books:

1. Abrahart: Dyes & their intermediates
2. P.H.Groggins: Unit Processes in Organic Sysnthesis

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COURSE CODE: 6SMCH304

Discipline Specific Elective-II
Drug and Heterocyclic Compounds

COURSE OBJECTIVES :-

The student will be able to
1. Know mechanism of Drug design
2.Define History and development of QSAR
3.Understand Antimalerials
4. Know Anti AIDS drugs
5. Explain Small ring Heterocycles
6. Learn Antibiotics
7. Understand Six membered Heterocycles.

Syllabus:

UNIT - I a) Drug design (10+2)
Development of new drugs, procedures followed in drug design, concepts of prodrugs and soft drugs. Theories of drug activity, Quantitative structure activity relationship. Theories of drug activity, Quantitative structure activity relationship.
History and development of QSAR. Concepts of drug receptors
b) Study of the Following types of drugs:I
a) Antibiotics: Preparation of semi synthetic penicillin, conversion of penicillin into cephalosporin, general account of tetracycline & macrocyclic antibiotics(no synthesis)
b) Antimalerials: Trimethoprim
c) Analgesic & Antipyretics: Paracetamol, Meperidine, methadone, Aminopyrine.

UNIT - II a) b) Study of the Following types of drugs:II (10+2)
i) Anti- inflammatory: Ibuprofen, Oxyphenylbutazone, Diclophenac, Indomethacin.
ii) Antitubercular & antileprotic : Ethambutol, Isoniazide & Dapsone
iii) Anaesthetics : Lidocaine, Thiopental.
iv) Antihistamines: Phenobarbital, Diphenylhydramine.
v) Tranquilizers: Diazepam, Trimeprazine.
vi) Anti AIDS: General study
vii) Cardiovascular: Synthesis of dilliazem, quinidine, methyldopa, atenolol, oxyprenol
viii) Anti-neoplastic drugs: Cancer chemotherapy, Synthesis of mechloraethamine, cyclophosphamide, Mephalan, uracils, mustards. Recent development in cancer chemotherapy. Hormones and natural products.

UNIT - III a) Small ring Heterocycles (10+2)
Three membered and four membered Heterocycles- synthesis and reactions of aziridines, oxiranes, thiranes, azetidines, oxitanes and thietanes.
b) Benzo fused five membered Heterocycles.
Synthesis and reactions of benzopyrroles, benzofurans and benzothiophenes.

UNIT - IV a) Six membered Heterocycles with one heteroatom (10+2)
and reactions of pyrilium salts and pyrones and their comparison pyridinium and salts and pyridones. Synthesis and reactions of coumarins, chromones.

UNIT - V a) Six membered Heterocycles with two and more Heterocycles
Synthesis and reactions of diazines & triazines.
b) Seven membered Heterocycles [5]
Synthesis and reactions of azepines, oxepines & thiepines.

COURSE CODE: 6SMCH304

COURSE OUTCOMES:-

1.Be able to understand Six membered Heterocycles
2.Be able to Know Benzo fused five membered Heterocycles
3.Be able to Know Synthesis of Cardiovascular drugs
4.Be able to define Antihistamines, Anaesthetics, Anti- inflammatory drugs
5.Be able to know Drug design
6.Be able to define Anti AIDS,Cardiovascular synthesis of drugs
7.Be able to understand oxepines & thiepines.

Lab.

1. How to design a drug in lab
2. Synthesis of antibiotic.
3. Case study of patient and identification of diseases.
4. Synthesis and reactions of coumarins, chromones.

Recommended Books:

1. A. Kar : Medicinal Chemistry (Wiley East)
2. W.O.Foye : Principals of medicinal chemistry
3. R.K. Bansal Heterocyclic chemistry (Wiley E)

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COURSE CODE: 6SMCH305

Discipline Specific Elective-I
Chemistry of Inorganic materials

COURSE OBJECTIVES :-

The student will be able to
1. Know Lattice Defects : point defects, Line defect and plane defect
2.Define Synthesis of Inorganic materials
3. Understand Ionic Conductors, Organic semiconductors
4. Know order & disorder phenomena
5. Explain Magnetic properties of Materials
6. Learn Synthesis of Inorganic materials(
7. Understand Metal and Alloys.

Syllabus:

UNIT - I A Lattice Defects(10+2)
Introduction to types of Solids, Perfect & imperfect crystals, point defects, Line defect and plane defect defect (definition & explanation of meaning) order & disorder phenomena, thermodynamics of Schottky & frenkel defect formation, Determination of defect, Nonstiochiometric defect (structural and thermodynamic aspects) incorporation of stiochometric excess of defects, thermodynamics of Nonstiochiometric phases.

UNIT - II B] Synthesis of Inorganic materials(10+2)
Synthesis of solid state materials using different techniques ceramic techniques, coprecipitation techniques, sol gel techniques, precursor techniques, high temperature & high pressure synthesis.

UNIT - III A] Ionic Conductors(10+2)
Types of ionic conductors, mechanism of ionic conduction, interstitial jumps, vacancy mechanism, diffusion, super ionic conductors, phase transition & mechanism of conduction in super ionic conductors, examples and applications of ionic conductors.
B] Electronic properties of materials
a) Organic semiconductors, examples, properties and application

UNIT – IV A] Magnetic properties of Materials(10+2)
Introduction, Magnetization, Electron spin and magnetic moment, Theory of diamagnetism, langevins theory & paramagnetic susceptibility of solids, ferromagnetism, Domain theory. Hysteresis in magnetism, ferrimagnetisms (ferries) Applications of magnetic materials.
B] Magnetic Materials
I] Structure and Properties of i) Metal and Alloys ii) Transition metal Oxides Formation and characteristics.

UNIT – V A] Advanced Inorganic Materials (10+2)
Nanotechnology and its business applications, Introduction to nanoscale, Potential applications of nanomaterials, Challenges and opportunities scope of nanotechnology, Commercialization scope Nanotechnology research in 21st century, Basic nanotechnology science and chemistry concepts, basic nanostructures , nanocomposites, Thin films, nanofoam, nanoclusters, smart nanostructures, manufacturing techniques of nanomaterials.

COURSE OUTCOMES :-

1.Be able to understand Lattice defects.
2.Be able to Know synthesis inorganic material.
3.Be able to differentiate nanocomposites, Thin films, nanofoam, nanoclusters.
4.Be able to understand susceptibility of solids.
5.Be able to Define Organic semiconductors.
6.Be able to understand high pressure synthesis
7.Be able to know Magnetic Materials.

COURSE CODE: 6SMCH305

PRACTICALS:

INORGANIC CHEMISTRY

Lab.

1**.** Synthesis of Inorganic materials
2. Study of metal and alloy
3.Determination of magnaetic properties of inorganic materials.

Recommended Books:

A.R.West, Solid State Chemistry
H.V.K. Keer Principles Of The Solid State Chemistry, Wiley Eastern

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COURSE CODE: 6SMCH306

Discipline Specific Elective-II
Co-ordination Chemistry

COURSE OBJECTIVES :-

The student will be able to
1. Know Mixed Ligand complexes
2.Define Transition metal complexes & catalysis.
3.Understand Magneto Chemistry
4. Know magnetic & thermal properties
5. Explain Theories of Metal-Ligand bonding

Syllabus:

UNIT – I Theories of Metal-Ligand bonding (10+2)
Molecular Orbital treatment, Octahedral (with and without pi bonding) tetrahedral and square planer complexes in a qualitative manner, comparison of theories of bonding, VBT, CFT, LFT and MOT.

UNIT – II Structural studies of coordination compounds
Compounds of first transition series elements, with respect to their electronic spectra, magnetic & thermal properties (DTA, TGA)

UNIT – III Magneto Chemistry (10+2)
Diamagnetic correction, single & multielectron system, types of the magnetic behaviour, Diamagnetism, Para magnetism, Ferro & Ferri, Antiferro and magnetic interaction, The origin of Para magnetism, Magnetic behavior of complexes, Simplification of Van Velck equation, magnitude of magnetic moments, Determination of magnetic susceptibility by Gouy and faraday method.

UNIT - IV Transition metal complexes & catalysis(10+2)
Introduction, General Principle, catalysis by transition metal complexes, Hydrocarbons Oxidation by Molecular oxygen, olefin Oxidation, olefin polymerization, olefin hydrogenation, Arene reactions catalyzed by metal complexes, catalysis of condensation polymerization reaction, Current and feature trend in catalysis.

UNIT – V Mixed Ligand complexes (10+2)
Stabilities of ternary complexes, Dynamics of formation of ternary complexes reaction of Coordination ligand in ternary complexes, Mimicking reactions in biological systems, enzyme models, Amino acids ester hydrolysis, peptide synthesis & hydrolysis, Detarbodylation of B keto acids

COURSE OUTCOMES :-

1.Be able to understand Mixed Ligand complexes.
2.Be able to Know ternary complexes.
3.Be able to differentiate nanocomposites, Thin films, nanofoam, nanoclusters.
4.Be able to understand peptide synthesis & hydrolysis.
5.Be able to Define Magnetic behavior of complexes.
6.Be able to know theories of bonding, VBT, CFT, LFT and MOT.

COURSE CODE: 6SMCH306

Lab.

1. Structural studies of coordination compounds through spectrometery.
2. Determination of magnetic susceptibility by Gouy and faraday method
3. Determination of stability constant of various complexes.

Recommended Books:

William L.Jolly : Modern Inorganic Chemistry, Mecgrow Hill USA, 1984
F.A. Cotton & R.G. Wilikinson: Advanced Inorganic Chem

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COURSE CODE: 6SMCH307

Discipline Specific Elective-I
Advanced Chemical kinetics

COURSE OBJECTIVES :-

The student will be able to
1. Know Steady State Approximation
2.Understand Electron transfer reaction
3. Know Catalysis
4. Explain cooperative and pseudo-phase ion exchange models
5. Learn Catalysis, Induced and cooxidations
6. Understand Mechanism of chromium(VI) oxidations

Syllabus:

UNIT – I Chemical kinetics: (10+2)
Steady State Approximation Collision theory of gas reaction , collision frequency. The rate constant, molecular diameters, collision theory vs. experiment Kinetics of Fast reactions: Relaxation techniques, pressure jump and temperature jump methods, NMR relaxation, flash photolysis and molecular beam methods.

UNIT - II Hydrogen ion dependence of reaction rates: (10+2)
Protonation and hydrolysis equilibria, determination of active reactant species form kinetic data, interpretation of hydrogen ion effect with example.

UNIT – III Electron transfer reaction: (10+2)
Complimentary and non-complimentary reactions, outer and inner-sphere electron transfer reactions, proton transfer, hydride transfer and hydrogen, oxygen and chlorine atom transfer reactions.

UNIT - IV Catalysis(10+2)
Trace metal ion catalysis and their mechanisms. Micellar catalysis, Berezini, Menger-Portonoy, cooperative and pseudo-phase ion exchange models and examples.

UNIT – V Mechanism of chromium(VI) oxidations: (10+2)
One and two equivalent reductants oxidation, assumptions, limiting forms of rate laws, Westheimer mechanism and its validity. Catalysis, Induced and cooxidations. Mechanisms other than Westheimer mechanism.

COURSE OUTCOMES :-

1.Be able to understand collision frequency
2.Be able to Know interpretation of hydrogen ion effect
3.Be able to differentiate Mechanism of chromium(VI) oxidations
4.Be able to understand Induced and cooxidations
5.Be able to Define Micellar catalysis
6.Be able to understand Westheimer mechanism and its validity

PRACTICALS:- (Paper-III)

Chemical Kinetics
1. Verification of Freundlich's Adsorption Isotherm,
2. Determination of effect of Change of temperature, Change of concentrations of reactants and catalyst.
3. Ionic strength of the media on the velocity constant of hydrolysis of ester.
4. Determination of order of reaction for reaction between K2S2O8 and KI.
5. Study of oxidation and reduction in chromium.

COURSE CODE: 6SMCH 307

PRACTICALS:

ELECTIVE-PHYSICAL CHEMISTRY

LAB

Chemical Kinetics

1.Verification of Freundlich's Adsorption Isotherm,
2.Determination of effect of Change of temperature, Change of concentrations of reactants and catalyst.
3.Ionic strength of the media on the velocity constant of hydrolysis of ester.
4.Determination of order of reaction for reaction between $K_2S_2O_8$ and KI.
5. Study of oxidation and reduction in chromium

Recommended Books:

Kinetics and Mechanism by .A. Frost and R.G. Pearson
Inorganic reaction mechanisms, Part II Edited by John O. Edwards,Interscience,1972

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COURSE CODE: 6SMCH 308

Discipline Specific Elective-II
Electro-chemistry

COURSE OBJECTIVES :-

The student will be able to

1. Know Electrolytic conductance
2. Define activity coefficients and their interrelationship
3. Understand Ion solvent interactions
4. Know Polarization
5. Explain Diffusion over potentials
6. Learn Electroanalytical Methods
7. Understand Colorimetric titrations

Syllabus:

UNIT – I Electrolytic conductance(10+2)

Debye - Huckel theory of inter-ionic attraction , ionic atmosphere, time of relaxation, relaxation and electro-phoretic effects, Debye-Huckel-Onsagar equation and its validity for dilute solutions and at appreciably concentrated solutions. Abnormal ionic conductance of hydroxyl and hydrogen ions.

Activity coefficients: forms of activity coefficients and their interrelationship.

Debye-Huckel limiting law its applications to concentrated solutions. DebyeHuckel

UNIT – II Ion solvent interactions and electrolysis(10+2)

The Born Model and expression for the free energy of ion- solvent interactions.

Thermodynamic parameters for the ion - solvent interactions. Calculations of heats of hydration of ions and the concept of hydration number .

Electrolysis: Decomposition potentials: calculations and determinations.

Polarization: types of polarization, over voltage and hydrogen and oxygen over voltage.

UNIT – III Electrode reactions. (10+2)

Tafel equations, kinetics of discharge of hydrogen ions . Diffusion over potentials.

Fuel cells: significance of fuel cells: hydrogen - oxygen, hydrocarbon - air, natural gas and carbon monoxide, air fuel cells. Corrosion: concept and importance, mechanism of corrosion and Pourbaix diagrams.

UNIT – IV Electrokinetic phenomena: (10+2)

Electrical double lever, theories of double layer,

electro-capillary phenomena, electro-capillary curve. Electro-osmosis, electrophoreses. Streaming and Sedimentation potentials. Zeta potentials and its determination by electrophoresis, influence of ions on Zeta potential.

UNIT – V Electroanalytical Methods - (10+2)

Potentiometric methods: Reference electrodes and indicator electrodes. The hydrogen calomel, Ag-AgCl electrodes. The glass electrode – its structure, perofrmance and limitations. Measurement of pH. Petentiometric titrations. Redox and precipitation titrations. Electrogravimetry: Principle and method. Determination of Cu. Separation of metals. Conductometry: Principle and method. Conductance measurements. Conductometric titrations. Colorimetry: Principle and method. Colorimetric titrations.

COURSE OUTCOMES :-

1.Be able to understand Polarization
2.Be able to Know Electroanalytical Methods
3.Be able to differentiate Redox and precipitation titrations
4.Be able to understand electro-capillary
5.Be able to Define Electrode reactions
6.Be able to understand . Zeta potentials
7.Be able to know Debye-Huckel limiting law

COURSE CODE: 6SMCH 308

LAB.

1. Colorimetric titrations
2. Conductometric titrations
3. Zeta potentials and its determination by electrophoresis
4. Decomposition potentials: calculations and determinations
5. Determination of activity coefficient.

Recommended Books:

1. Modern Electrochemistry Vol. I & II by J.O.,.Bockris and A.K.N.Reddy
2. Physical Chemistry by S. Glasstone
3. Electrolytic Solutions by R.A. Robinson and R.H. Strokes

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COURSE CODE: 6SMCH401

Discipline Specific Elective-III
Chemistry of Natural Products

COURSE OBJECTIVES :-

1. Know Terpenoids
2.Define Alkaloids
3.Understand Prostaglandins
4. Explain carbohydrates and proteins
5. Learn Synthesis and structure of biotin and vitamin B2
6. Understand biological functions of B6

Syllabus:

UNIT – I Terpenoids (10+2)
Structure and synthesis of abietic acid, zingiberene, santonin, cuparenonne and caryophyllene.

UNIT - II Alkaloids (10+2)
Structure, stereochemistry, synthesis and biosynthesis of the following Structure of morphine, reserpine, ephedrine, (+) Conin.

UNIT - III a) Steroids(10+2)
Occurrence, nomenclature, basic skeleton, Diels hydrocarbon and study of the following hormones, Androsterone, Testosterone, Estrone, Progesterone, Aldosterone and cartisone. Biosynthesis of steroids.
b) Prostaglandins
Occurrence, nomenclature, classification, biogenesis and physiological effects, Synthesis of PGE2 and PGF2

UNIT - IV Biogenesis (10+2)
Alkaloids (pyridine, morphine and indole type) terpenoids of classes with examples, cholesterol, flavones, coumarins, carbohydrates and proteins.

UNIT - V Vitamins (10+2)
Synthesis and structure of biotin and vitamin B2, synthesis of vitamin B1, biological functions of B6, B12, folic acid and thiamin.

COURSE OUTCOMES:-

1.Be able to understand synthesis of vitamin B1
2.Be able to Know Terpenoids Structure and synthesis of abietic acid
3.Be able to differentiate Biogenesis
4.Be able to Define Occurrence, nomenclature, classification, biogenesis and physiological effects
5.Be able to understand Testosterone, Estrone, Progesterone.

Lab

Preparation

Preparation of selected inorganic compounds and their study by IR, electronic spectra, and magnetic susceptibility measurements. Handling of air and moisture sensitive compounds involving vacuum lines. Selection can be made from the following:

1. Sodium amide.
2. Atomic absorption analysis of Mg and Ca.
3. Synthesis of trichlorodiphenylantimony (V) hydrate.
4. Sodium tetrathionate $Na_2S_4O_6$.
5. Metal complex of dimethyl sulfoxide : $CuCl_2.2DMSO$.
6. Synthesis of metal acethylacetonate :.
7. Cis and Trns $[Co(en)_2CI_2]^+$.
8. Determination of Cr (III) complex. $[Cr(H_2O)_6]NO_3.3HO$,.
9. Preparation and use of Ferrocene.
10. Preparation of [Co(phenathroline-5,6 quinone)].

COURSE CODE: 6SMCH402

Discipline Specific Elective-IV
Stereochemistry

COURSE OBJECTIVES :-

1. Know Stereochemistry of Organic Compounds
2.Define stereotopicity and enantiomeric excess
3.Understand stereoselective and stereospecific reactions
4. Know Diels Alder selective synthesis
5. Explain Fused and bridged rings: Fused bicyclic ring systems
6. Learn Bridged rings, Nomenclature stereoichemical restrictions

Syllabus:

UNIT - I Stereochemistry of Organic Compounds(10+2)
Molecular chirality and stereochemical nomenclature. Molecules with chiral axes and planes. Molecular shape, topology and optical activity. Atropisomerism and its designation. Racemisation, resolution, prostereoisomerism, stereotopicity and enantiomeric excess. Non-carbon chiral centres. Introduction to chiroptical properties.

UNIT - II Newer methods of stereoselective synthesis(10+2)
Introduction and stereoselective and stereospecific reactions. Enantioselective synthesis (chiral approach) reactions with hydride donors, hydroboration, catalytic hydrogenation via chiral hydrazones and oxazolines. Sharpless epoxidation. Diels Alder selective synthesis, use of calculations of optical purity and enantiomeric excess.

UNIT – III a)Conformation and reactivity in acyclic compounds and of cyclohexanes(10+2)
Stability and reactivity of diastereoisomers. Curtin- Hammett principle,
b) Some aspects of the stereochemistry of ring systems
Stereoisomerism and determination of configuration Stability of rings and ease of rings formation)
c) The shapes of the rings other than six membered: Shapes of five, six, and seven membered rings

UNIT – IV a) Fused and bridged rings: Fused bicyclic ring systems : (10+2)
Cis and trans decalins and perhydrophenanthrene. Bridged rings, Nomenclature stereoichemical restrictions, and The Bredt's rule, Reactivities.
b) O.R.D. and C.D. : Types of curves, the axial haloketone rule.
The Octant rule. Determination of conformation and configuration.

UNIT – V a) Stereochemistry of Allenes, Spiranes and Biphenyls (10+2)
Assignment of configuration
b) Configuration of diastereomers based on physical and chemical methods.

COURSE OUTCOMES :-

1.Be able to understand Stereochemistry of Allenes
2.Be able to Know Configuration of diastereomers
3.Be able to differentiate O.R.D. and C.D
4.Be able to understand hydroboration, catalytic hydrogenation via chiral hydrazones
5.Be able to Define aspects of the stereochemistry of ring systems
6.Be able to explain use of calculations of optical purity and enantiomeric excess.

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Lab.

***Spectrophotometric Determinations / Spectroscopic identification of recorded spectra like IR, NMR,* ESR and Mass**

a. Manganese/Chromium in steel sample.
b. Nickel by extractive spectrophotometric method.
c. Fluoride/nitrite/phosphate.
d. Copper-Ethylene diamine complex : Slope-ratio method.

Flame Photometric Determinations

a. Sodium and potassium when present together.
b. Lithium/calcium/barium/strontium.
c. Cadmium and magnesium in tap water.

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COURSE CODE: 6SMCH403

Discipline Specific Elective-III
Separation Science

COURSE OBJECTIVES :-

1. Know application of diketone
2.Define Solvent Extraction Separation
3.Understand chromatographic inert support
4. Know theory of break through curves
5. Explainapplication of diketone, hydroxyquinoline, oximes
6. Learn use of non aqueous solvents in one exchange separation
7. Define flow programming chromatography

Syllabus:

UNIT- I Solvent Extraction Separation(10+2)

Principles of solvent extraction, formation of metal complexes, distribution of extractable species, quantitative treatment of extractable equillibria, Methods of extraction, techniques in extraction, application of diketone, hydroxyquinoline, oximes, dithiocarbamates, xanthets, thiols, macrocyclic polythenes and orgao phosphouous compounds in solvent extraction. Separation of nonmetals and metals.

UNIT - II Chromatographic separation techniques(10+2)

Extraction chromatography, theoretical aspects of extraction chromatography, correlation between solvent extraction and extraction chromatography, techniques in extraction chromatography, chromatographic inert support, stationary phases, use of extraction chromatography for separation of fission products.

UNIT – III Ion exchange separation(10+2)

Fundamental properties of ion exchangers, theories of ion exchange, exchange capacity, screening effect, penetration of electrolytes into the ion exchange resins, sorption of complex ions, ion exchanges equilibrium, column operation, theory of break through curves, elution steps, use of non aqueous solvents in one exchange separation, application of ion exchange separation in determination of total salt concentration, removal of interfering ions, separation of anions and metals.

UNIT – IV Separation by electrolysis Basic principles, over potentials, electrogravimetry, constant current electrolysis,separation with controlled electrode potentials, constant voltage electrolysis, potentialbuffers, and physical characteristics of metal deposits, internal electrolysis,electrography, electrophoresis, and electro chromatography.

UNIT – V Gas Chromatography (10+2)

Principles of gas chromatography, plate theory of gas chromatography, Instrumentation for gas chromatography, working gas chromatography, application of gas chromatography, programmed temperature chromatography, flow programming chromatography, gas-solid chromatography, and hyphenated techniques in chromatography Problems.

COURSE OUTCOMES :-

1.Be able to understand Principles of gas chromatography
2.Be able to Know internal electrolysis, electrography
3.Be able to differentiate programmed temperature chromatography, flow programming chromatography, gas-solid chromatography
4.Be able to understand use of non aqueous solvents in one exchange separation
5.Be able to Define application of gas chromatography

COURSE CODE: 6SMCH403

Lab. Organic Chemistry

Multi-step Synthesis of Organic Compounds

The exercise should illustrate the use of organic reagents and may involve purification of the products by chromatographic techniques.

Photochemical reaction Benzophenone -> Benzpinacol _> Benzpinacolone

Beckmann rearrangement : Benzanilide from benzene

Benzene -> Benzophenone -> Benzphenone oxime -> Benzanilide Benzilic acid rearrangement : Benzilic acid from benzoin Benzoin -> Benzil -> Benzilic acid

Synthesis of heterocyclic compounds Skraup synthesis : Preparation of quinoline from aniline

Fisher Indole synthesis : Preparation of 2-phenylindole from phenylhydrazine.

Enzymatic synthesis Enzymatic synthesis Enzymatic reduction : reduction of ethyl acetoacetate using Baker's yeast to yield enantiomeric excess of S (+) ehtyl-3-hydroxybutanoate and determine its optical purity.

Biosynthesis of ethanol from sucrose.

Synthesis using microwave Alkylation of diethyl malonate with benzyl chloride. Synthesis using phase transfer catalyst. Alkylation of diethyl malonate or ethyl acetoacetate with an alkylhalide.

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COURSE CODE: 6SMCH404

Discipline Specific Elective-IV
Organ Metallic Chemistry

COURSE OBJECTIVES :-

1. Know Methyl derivatives of metals
2.Define Catalytic processes of Carbonylation, hydrogenation
3.Understand reactions of bimetallic compounds and halides
4. Know organomettallic reactions with oxygen, carbonyls and others
5. Explain isomerisation of olefins
6. Learn ,3,4,5,6 and 7 electron donor carbametallic compounds

Syllabus:

UNIT – I A] Methyl derivatives of metals (10+2)
Structures, bonding, classification of methyl derivatives of metals, cleavage of metal carbon bonds, thermochemical consideration.
B] Catalytic processes
Carbonylation, hydrogenation, isomerisation of olefins, olefin oxidation, oligomerization, polymerization.

UNIT – II Organometallic synthesis(10+2)
Radicals + metals, carbonyls, olefins complexes, addition of metal hydrides to unsaturated carbons,, addition of metal alkyls to unsaturated hydrocarbons, substitution reactions, Hydrocarbons + metal Organometallic + metal, mettalation, metal halogen exchange reactions, Mercuration & related covalent metallation reactions of Organometallic compounds with metal salts, reactions of bimetallic compounds and halides, ligand exchange reactions of diazoalkanes with metal hydrides and halides, addition of M-OR to C=c, electrolyte reduction using metal cathode, decarboxylation.

UNIT – III Properties of reactions of Organometallic compounds (10+2)
Complex formation, reactions with active oxygen compounds, reactions with halogen, reactions with alkyl halides, acid halides, reactions with oxygen, carbonyls and others.

UNIT – IV Metal carbonyls, isocyanides and acetylides. (10+2)
Preparation, structure, reactions of metal carbonyls with alkyl halides, reactions of metal carbonyls with metal alkyls, cyanides and isocyanides complexes, acetalynide complex adduct formation. Complexes: 2,3,4,5,6 and 7 electron donor carbametallic compounds, aromaticity of cyclopentadienyls.

UNIT – V Techniques of Organometallic Chemistry (10+2)
Methods of synthetic chemistry, vacuum techniques, inert atmosphere, nonaqueous media, handling and hazards of organ metallic.

COURSE OUTCOMES :-

1.Be able to understand cleavage of metal carbon bonds, thermochemical consideration
2.Be able to Know olefins complexes, addition of metal hydrides to unsaturated carbons
3.Be able to differentiate Methods of synthetic chemistry
4.Be able to understand aromaticity of cyclopentadienyls
5.Be able to Define Mercuration & related covalent metallation reactions of Organometallic compounds with metal salts.

COURSE CODE: 6SMCH404

Lab.

Spectroscopy

Identification of organic compounds by the analysis of their spectral data (UV, IR, PMR, CMR & MS) Spectrophotometric (UV/VIS) Estimations/isolation of the following (any one compound)

Spectroscopic estimation

1. Amino acids
2. Proteins
3. Carbohydrates
4. Ascorbic acid
5. Aspirin
6. Caffeine

Isolation

1. Casein from milk
2. Lycopine from tomato
3. Piperine from black pepper
4. Caffeine from tea leaves
5. Lactose from milk

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COURSE CODE: 6SMCH405

Discipline Specific Elective-III
Surface Chemistry

COURSE OBJECTIVES :-

1. Know Adsorption and surface phenomenon.
2. Define Langmuir and B. E. T. equation and significance in surface area etermination.
3. Understand significance and experimental verification.
4. Know micellisation, critical micelle concentration (cmc) thermodynamics of micellisation.
5. Explain Types of emulsion, theories of emulsion and emulsion stability.
6. Learn Liquid gas and liquid interfaces.
7. Understand Solid - Solid interfaces, Surface energy of solids, adhesion and adsorption.

Syllabus:

UNIT – I Adsorption and surface phenomenon (10+2)

Physisorption and chemisorption , adsorption isotherms, Langmuir and B. E. T. equation and significance in surface area determination, surface films, states of insoluble films, L. B. films and their application, adsorption from solution, adsorption types, surface excess concentration , Gibb's adsorption equation : derivation , significance and experimental verification , catalytic activity of surfaces.

UNIT – II Micelle (10+2)

Surface activity, surface active agents and their classification, micellisation, critical micelle concentration (cmc) thermodynamics of micellisation , factors affecting cmc, methods of determination of cmc , reverse micelle , solubisation of water insoluble organic substances , use of surfactants in oil recovery ,

UNIT- III Emulsion(10+2)

Types of emulsion, theories of emulsion and emulsion stability, identification of Emulsion types, inversion emulsion, micro emulsion: theory and application ,

UNIT – IV Liquid gas and liquid interfaces: (10+2)

Surface tension, capillary action, methods of determination of surface tension, surface tension across curved surfaces, vapor pressure of droplet (Kelvin equation) , surface spreading , spreading coefficient, cohesion and adhesion energy,contact angle, constant angle hysteresis, wetting and detergency.

UNIT - V Solid - Solid interfaces (10+2)

Surface energy of solids, adhesion and adsorption, sintering and sintering mechanism, Tammann temperature and its importance, surface structure and Surface composition.

COURSE OUTCOMES :-

1. Be able to understand Gibb's adsorption equation : derivation
2. Be able to Know Tammann temperature and its importance,
3. Be able to differentiate theories of emulsion and emulsion stability
4. Be able to understand sintering and sintering mechanism
5. Be able to Define factors affecting cmc, methods of determination of cmc
6. Be able to understand Effects of adhesion and adsorption, sintering and sintering mechanism

LABORATORY WORK

Lab Physical Chemistry

Spectroscopy

i. Determination of PKa of an indicator (e.g. methyl red) in (a) aqueous and (b) micellar media.
ii. Determination of stoichiometry and stability constant of Ferricisothicoyanation complex ion in solution.
iii. Determination of rate constant of alkaline bleaching of Malachite green and effect of ionic strength on the rate of reaction.

Chemical Kinetics

i. Determination of rate constant and formation constant of an intermediate complex in the reaction of Ce(IV) and Hypophosphorous acid at ambient temperature.
ii. Determination of energy and enthalpy of activation in the reaction of KMnO4 and benzyl alcohol in acid medium.
iii. Determination of energy of activation of and entropy of activation from a single kinetic run.
iv. Kinetics of an enzyme catalyzed reaction.

COURSE CODE: 6SMCH406

Discipline Specific Elective-IV
Chemistry of Materials

COURSE OBJECTIVES :-

1. Know Ceramic structures, mechanical properties, clay products Reformatories, characterizations
2. Define Tc superconductivity in cuprates, preparation and characterization of 1-2-3 and 2-1-4 materials
3. Understand stress- strain behaviour, Thermal behaviour of polymers.
4. Know conducting and ferro -Electric polymers
5. Explain Molecular shape , structure and configuration, crystallinity, stress- strain behavior, Thermal behavior, polymer types

Syllabus:

UNIT – I Glasses, Ceramics, Composite and Nanomaterials(10+2)

Glassy state, glass formers and glass modifiers, applications, Ceramic structures, mechanical *properties, clay products. Reformatories,characterizations, properties and applications.Microscopic composites*; dispersion - strengthened and particle - reinforced, fibre - reinforced composites, macroscopic composites. Nanocrystline phase, preparation procedures, special properties, and applications.

UNIT – II High Tc Materials(10+2)

Defect perovskites, high Tc superconductivity in cuprates, preparation and characterization of 1-2-3 and 2-1-4 materials, and normal state properties; anisotropy; temperature dependence of electrical resistance; optical photon modes,superconducting state; heat capacity; coherence length, elastic constants, positionlifetimes, microwave absorption - pairing and multigap structure in highTc materials , applications of high Tc materials.

UNIT – III Polymeric Materials(10+2)

Molecular shape , structure and configuration, crystallinity, stress- strain behavior,Thermal behavior, polymer types and their applications, conducting andferro -Electric polymers.

UNIT – IV a)Thin films and Langmuir- Blodgett Films: (10+2)

Preparation techniques; evaporation / sputtering, chemical processes, MOCVD, sol - gel etc. Langmuir- blodgett (lb) film, growth techniques, photolithography, properties and application of thin and LB films.

UNIT – V Materials of Solid Devices (10+2)

Rectifiers, transistors, capacitors IV-V compounds, low dimensional quantum Structure; optical properties.

COURSE OUTCOMES :-

1. Be able to understand Glassy state, glass formers and glass modifiers, applications
2. Be able to Know strengthened and particle - reinforced, fibre -reinforced composites
3. Be able to differentiate High Tc Materials, pairing and multigap structure in highTc materials
4. Be able to understand Thin films and Langmuir- Blodgett Films
5. Be able to Define conducting and Ferro -Electric polymers
6. Be able to understand Effects of optical photon modes, superconducting state
7. know applications of applications of high Tc materials.

COURSE CODE: 6SMCH406

LABORATORY WORK
Lab Physical Chemistry

Thermodynamics

i. Determination of partial molar volume of solute (e.g. KCl) and solvent in a binary mixture.
ii. Determination of the temperature dependence of the solubility of a compound in two solvents having similar intromolecular in tetractions (benzoic acid in water and in DMSO water mixture and calculate the partial molar heat of solution.

Polarography

i. Identification and estimation of metal ions such as Cd+2, Pb+2, Zn+2, and i+2 etc. polarographically.
ii. Study of a metal ligand complex polarographically (using Lingane's Method).

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