हिमाचल प्रदेश केंद्रीय विश्वविद्यालय
Central University of Himachal Pradesh
अस्थाई शैक्षणिक खण्ड, शाहपुर, ज़िला काँगड़ा, (हि.प्र.) - 176206
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Detail syllabi:

M.Sc 3rd Semester

CCS 559- ADVANCE ANALYTICAL TECHNIQUES (Credit-2)
UNIT (I): Introduction to Chromatography
Basic principle of Analytical techniques. Different types of Chromatography techniques and their applications. Thin layer Chromatography – Basic principle, methodology, application.
UNIT (II): High Performance Liquid Chromatography
Basic Principle, Methodology, Application. Discussion with examples based on published research papers.
UNIT (III): Gas Chromatography
Basic Principle, Methodology, Application. Discussion with examples based on published research papers.
UNIT (IV): Liquid and Gas Chromatography - Mass spectrometry
Basic Principle, Methodology, Application. Discussion with examples based on published research papers.
Course Code: CCS 411
Course Name: Statistical error, Electrochemical analyses, Environmental analyses (2 Cr.hrs)
UNIT I: Accuracy and precision of analytical procedure; Types of errors in quantitative analyses: systematic errors and random errors; Propagation of Error
UNIT II: Presentation of analytical results: descriptive statistics, Normal and Gaussian distribution and its properties, standard deviation, normal distribution of mean, confidence limits of the mean; regression and correlation
UNIT III Sampling and sample preparation: Sample plan, sample preservation, sample pretreatment, Extraction techniques used in sample preparation (Classical methods and solid phase extraction, Supercritical fluid extraction, micro-wave extraction, Pressurized Liquid extraction). Method validation (Figure of merits).
UNIT III: Atmospheric Aerosols:PM2.5 and PM1.0; Health implications of atmospheric aerosols; Methods of determination of PM2.5 and PM1.0 aerosols concentration Toxic chemical species associated with atmospheric aerosols; heavy metals, poly-nuclear aromatic hydrocarbons (PAHs) and pesticides etc. Application of electrochemical analytical (including Voltammetric) methods to determine heavy metals.

CCS 540- ADVANCED STEREOCHEMISTRY- (Credit-2)
UNIT I: Stereochemistry of polycyclic system:

a) Dynamic Aspects: Cyclisation reactions, Baldwin Rule; elimination, addition and rearrangement reactions.
b) Stereospecific and stereoselective reaction, asymmetric synthesis, absolute asymmetric synthesis, Sharpless epoxidation reaction, Sharpless dihydroxylation, stereochemistry of some important reactions. (Aldol reaction, Witting reaction and Diel's Alder reaction)
c) Conformation and reactivity of fused polycyclic systems perhydrophenanthrenes, perhydroanthracene, steroids.
UNIT II: Chiroptic properties: a) Optical activity: Principles, emperical rules and correlations, calculation of optical rotation.
b) Optical rotatory dispersion (ORD): Principles, cotton effects, empirical rulesaxial haloketone rule, octane rule, Lowe's rule, Determination of configuration and conformation.

CCS 501- CHEMISTRY GENERAL (INTERDISCIPLINARY TOPICS) [Credit -4]

UNIT I: **Supramolecular Chemistry**

Introduction, Origins and Concept. Molecular recognition. Host-guest complex. Supramolecular reactivity and catalysis. Self-assembly, Liquid crystals and supramolecuar polymers, Supramolecular interactions; van der Waal interactions, dipole-dipole, pi-pi interactions. Allosterism, proton and hydride sponges, Anion recognition and anion coordination chemistry.

UNIT II: **Supramolecular Chemistry (Kinds and Characteristics)**

Different types of receptors with special reference of Crown ethers, cryptates and Calix[4]arene, superstructures in organometallic compounds, supramolecular devices, dendrimers. Applications of supramolecular chemistry in drug design. Application in material science-molecular machines (Molecular sensors and supramolecular devices).

UNIT III: **Nanoscience and Technology**

Definition, historical perspective and effects of nanoscience and nanotechnology on various fields. Bottom up and top down approaches. Synthesis of nanoparticles by chemical routes (sol-gel synthesis, micro emulsion technique, hydrothermal synthesis, polyol synthesis) and characterization techniques: TEM; SEM; AFM; XPS. Properties of nanostructured materials: Optical properties; magnetic properties; chemical properties. Microporous material, microgels, bioconjugate polymers, Nanoencapsulation.

UNIT IV: **Medicinal Chemistry**

Drugs: Introduction Drug design, Classification of drugs, brief discussion of drug targets, Drugs based on enzyme inhibition: penicillin antibiotics and sulphonamides (Mechanism of drug action). Drug targets on nucleic acids (Alkylating agents and intercalating agents). Definition of antagonist, agonist, prodrugs, pharmacokinetics and pharmacodynamics, concept of structure-activity relationship (SAR) and quantitative structure activity relationship (QSAR) with special reference to penicillin antibiotic and sulphonamides. Concept of LD_{50} and ED_{50}. Cardiovascular drugs.

CCS 567- SPECIAL PAPER-II-INORGANIC CHEMISTRY (Credit-02)

UNIT I: Group theory and its Applications in Spectroscopy

Selection rules and its relaxation, Energy Terms and Orgel diagram, Splitting of terms in octahedral and tetrahedral ligand fields,

UNIT II: Advanced Organometallic Chemistry

Catalysis by organometallic compounds: Tolman Catalytic loop, Hydrogenation, Wilkinson Catalyst, Polymerization -Zieggler Natta catalysis, Phase transfer catalyst (PTC), Synthesis gas-Water gas shiftreaction, Hydroformylation (Oxo process), Monsantro Acetic Acid process, Walcker process, Syntheticgasoline – Fischer Tropsch process and metatheses reaction.

UNIT III: Application of Nuclear Chemistry

Nuclear stability, Nuclear cross-sections, Nuclear reactions: types of reactions, Nuclear fission-fissionproduct and fission yields,

UNIT IV: Radioactive techniques:

Tracer technique, (neutron activation analysis), Counting techniques such as G.M.Ionization and proportional counters.

CCS 566- SPECIAL PAPER-I- ORGANIC CHEMISTRY (Credit-2)

UNIT I: **Mass spectrometry**
Basic instrumentation, ion production - E1, C1, FD, FAB and MALDI techniques.Mass spectral fragmentation of typical organic compounds, common functional groups.

UNIT II: **Nuclear Magnetic Resonance (NMR) Spectroscopy**
Basic instrumentation, nuclear spin, nuclear resonance, saturation, shielding of magnetic nuclei, chemical shift and its measurements, factors influencing chemical shift, deshielding, spin-spin interactions, factors influencing coupling constant 'J'- Karplus equation. Classification of molecules. (AB, ABX, AMX, ABC, A_2B_2 etc. types), spin decoupling. FT NMR. (qualitative idea) and its advantages.

UNIT III: **Organometallic Chemistry of Transitional Elements**
Preparative structural and characteristic aspects. Coupling reactions, Kumada, Heck, Sonogashira, Nigishi, Stille, Suzuki, Hyiama, Buchwald-Hartwigreactions, Tebbe's reagent, Pauson-Khand reaction. Fluctional organometallic compounds. Chemistry and use of organo-derivatives of non-transitional metals- tin, thalium, mercury, lead.

UNIT IV: **Organometallic Reagents in organic syntheses and Structure Determination of Organic Compounds**
(a) Use of Si, S, B, Cr, Ti, Co, Rh, Ru, Pd, Cu, Ni, Fe and Ce in organic syntheses.
(b) Elucidation of the structures of the organic molecules by spectra (IR, UV-vis, NMR and Mass)

CCS 568- SPECIAL PAPER-III- PHYSICAL CHEMISTRY (Credit-02)

UNIT-I
The concept of group, Symmetry elements and symmetry operations, Symmetry properties of atomic orbital, Elements of group theory: groups, subgroups, classes and characters, classes of symmetry operations, symmetry point groups; representation of groups by matrices, Representation of symmetry operator transformation of basis vector, Symmetry transformation of operators; The Great Orthogonality Theorem (without proof) and its consequences; construction and applications of character tables, representation of cyclic groups.

UNIT-II
Assignment of point groups to Inorganic molecules, Some general rules for multiplications of symmetry operations, Multiplication tables for water and ammonia, Representations (matrices, matrix representations for C_{2V} and C_{3V} point groups irreducible representations), Character and character tables for C_{2V} and C_{3V} point groups.

UNIT-III
Applications of group theory to chemical bonding (hybrid orbitals for σ-bonding in different geometries and hybrid orbitals for π-bonding.Symmetries of molecular orbitals in BF_3, C_2H_4 and B_2H_6.

UNIT-IV
Application of Group Theory in Vibrational Spectroscopy: A brief idea about Infrared and Raman scattering spectroscopy. Vibrational modes as basis of group representations w.r.t. SO_2, $POCl_3$, $PtCl_4^{2-}$ and RuO_4, Mutual exclusion principle, Classification of vibrational modes (i.e. stretching and angle deformation vibrations w.r.t. SO_2, $POCl_3$ and $PtCl_4^{2-}$.

CCS 538- BIOCHEMISTRY-I (Credit-2)

UNIT I: Proteins

Amino acid : Classification and structure

Levels of Protein structure

Biologically important Peptides.

UNIT II: Nucleic Acids and Nucleotides

◦ Structure of nucleotides

◦ Structure and types of DNA

◦ Structure and types of RNA

UNIT III: Enzymes

◦ Classification

◦ Nomenclature

◦ Enzymes inhibition

UNIT IV: Vitamins

◦ Classification

◦ Individual vitamins :

a. Chemistry
b. Biochemical functions
c. Dietary Sources
d. Deficiency symptoms

CCS 411- STATISTICAL ERROR, ELECTROCHEMICAL ANALYSES,ENVIRONMENTAL ANALYSES (Credit-2)

UNIT I: Errors in quantitative analyses, types of errors, handling of systematic errors, random

errors, random walk phenomenon, Normal and Gaussian distribution and its properties, standard

deviation, normal distribution of mean, confidence limits of the mean, propagation of random

errors, presentation of results. Method of reporting computed data.

UNIT II: Toxic inorganic substances. Health hazards of SPM [Suspended (inorganic) Particulate

Matter], IPM [Inhaleable (inorganic) Particulate Matter]. Methods of determination of SPM

(High Volume Sampler) and IPM (Cascade Impactor). Heavy metal toxicities. Mechanism of

toxicity. Pesticides, metallo-organic compounds and their toxicity. Application of some

analytical methods to determine toxic species.

M.Sc 1st Semester

CCS 401- ORGANIC CHEMISTRY I [Credit -4]

UNIT-I: **Bonding in Organic Compounds-I**

Qualitative M.O. approach to bonding in organic molecules, Huckel`s rule and its applications to ethylene, cyclopentadiene, butadiene, cyclobutadine. Walsh orbitals of cyclopropane. Delocalized chemical bonding: conjugation, cross conjugation, resonance, hyperconjugation, bonding in fullerene, tautomerism. Huckel`s approach to conjugated systems, concept of aromaticity (η) in benzenoid and non benzenoid compounds, alternate and non-alternate hydrocarbons,. Energy level of pi–molecular orbitals;

UNIT-II: **Bonding in Organic Compounds-II**

Annulenes and heteroannulenes, fullerenes (C60), antiaromaticirty pseudo - aromaticity, homo aromaticity - PMO approach. Bonds weaker than covalent bond-addition compounds, crown ether complexes and cryptands, inclusion compounds, cyclodextrins, catanates and rotaxanes. Stability of carbocations, strained organic molecules, calculation of strain energies.

UNIT-III: **Stereochemistry and Conformational Analyses**

Elements of symmetry, chirality, molecules with more than one chiral center, point groups, nomenclature: threo- and erythro- isomers, methods of resolution and optical purity, enantiotopic and diastereotropic atoms, groups and faces. Conformational analysis- acyclic systems up to 4 chiral centers, cyclohexane, cyclohexanone, cyclohexene; decalin, conformation of sugars. Effects of conformation on the reactivity of acyclic compounds and cyclohexanes. Stereochemistry of monocyclic, bicyclic and tricyclic systems (typical examples). Optical activity in absence of chiral carbon (biphenyls, allenes and spirans), chirality due to helical shape. Stereochemistry of organo nitrogen-, sulfur- and phosphorus- compounds.

UNIT-IV: **Organic Reaction Mechanism**

Addition to C-C multiple bonds : Mechanistic and stereochemical aspects of addition reactions involving electrophiles, nucleophiles and free radicals, regio- and chemo selectivity, orientation and reactivity. Hydrogenation of double and triple bonds and aromatic rings. Hydroboration reaction, Sharpless asymmetric epoxidation. Addition to Carbon- Hetero Multiple Bonds: Mechanism of metal hydride reaction of substituted and unsubstituted carbonyl compounds, acids, esters and nitriles. Addition of Grignard reagents, organo-Zn and organo-Li and organo Si reagents to saturated and unsaturated carbonyl compounds. Wittig reaction. Mechanism of condensation involving enolates.

CCS 402- INORGANIC CHEMISTRY I [Credit -4]

UNIT-I: **Aspects of Chemical Bonding**

LCAO-MO and VB treatments on H_2^+, H_2 : Valence bond theory (VBT), resonance in VBT, VBT of homonuclear diatomic molecules, sigma and pi bonds, VBT of heteronuclear diatomic molecules, inadequacies of the simple VBT. Hybridization, participation of *d* orbitals in hybridization in polyatomic species. Molecular orbital theory (MOT), linear combination of atomic orbitals (LCAO), criteria for the formation of stable MOs. Sigma, Pi and Delta molecular orbitals. Homonuclear and heteronuclear diatomic molecules and ions. MO theory of polyatomic molecules and ions. MO theory of π bonding and multi-centre bonding. MO concept of metal-ligand bonding (pictorial approach); VSEPR Theory.

UNIT-II: **Theory of Coordination Chemistry-I**

Crystal Field Theory: Spitting of d orbitals in crystal fields of different symmetry for similar and dissimilar ligands (Octahedral, tetrahedral, Linear, trigonal planar, trigonal bipyramidal, square pyramid), crystal field stabilization energies (CFSE), spectrochemical series, octahedral site preference energy (OSPE) and their applications. Tetragonal distortion (John-Teller effect). Thermodynamic aspects of crystal field splitting (variation of ionic radii, lattice energy, hydration enthalpy and stability constants of complexes – Irving Williams order).

UNIT-III: **Theory of Coordination Chemistry-II**

Kinetic aspects of crystal field stabilization: crystal field activation energy, labile and inert complexes. Spin and orbital moments, spin-orbit coupling, quenching of orbital moment, spin only formula, temperature dependence of magnetic moment, Super exchange Phenomena, Diamagnetic Corrections. Dependence of Orbital contribution on

the nature of the electronic ground state. Structural and stereoisomerism of coordination compounds, optically active coordination compounds and their resolution procedures, absolute configuration ofenantiomers.

UNIT-IV: **Chemistry of d- and f- Block Elements (Comparative Study)**

Electronic configuration, oxidation states; aqueous, redox and complex chemistry, spectral and magnetic properties of compounds in different oxidation states, horizontal and vertical trends in respect of 3d,4d, and 5d elements with references to Ti-Zr- Hf , Cr- Mo- W, Mn Tc-Re and Pt group metals. Occurrence and isolation in respect of Mo, W, Re, Pt. Synthesis, properties, reactions, structure and bonding as applicable in respect of: Mo blue, W-blue, Pt-blue, W-bronze, Ru-red, Creutz- Traube complexes, Vaska`s complexes. Lanthanide and Actinide Elements; Nuclear stability, terrestrial abundance and distribution, relativistic effect, electronic configuration, oxidation states, aqueous-, redox and complex- chemistry; electronic spectra and magnetic properties (one example each). Lanthanide and actinide contractions and their consequences, separation of lanthanides and actinides and their applications (with examples).

CCS 403- PHYSICAL CHEMISTRY I [Credit -4]

UNIT-I: **Thermodynamics-I**

Classical Thermodynamics; Brief resume of the laws of thermodynamics, of concepts of enthalpy, free energy, chemical potential, entropies and spontaneity. Temperature and pressure dependence of thermodynamic quantities; Gibbs- Helmholtz equation. Chemical equilibrium: free energy and entropy of mixing. Partial molar properties: partial molar free energy, partial molar volume, partial molar heat content and their significances. Gibbs-Duhem equation. Maxwell's relations; elementary description of phase transitions; phase equilibria and phase rule; thermodynamics of ideal and non-ideal gases, and solutions.

UNIT-II: **Thermodynamics-II**

Statistical Thermodynamics; Thermodynamic probability and entropy, Maxwell Boltzman, Partition function: rotational, translational, vibrational and electronic partition functions of diatomic molecules, calculation of thermodynamic functions and equilibrium constants. Theories of heat capacities of solids. Concept of ensemble and ergodic hypothesis phase space. Microcanonical ensemble, Canonical ensemble distribution probability partition function, its relation with different thermodynamic state functions. Gibb's paradox and Sackur- Tetrode equation. Concept of thermal wave length. Equipartition theorem and its validity. Chemical potential and chemical equilibrium. Heat capacity of solids.

UNIT-III: **Surface Chemistry and dielectric Behaviour**

Surface phenomena: Vapour pressure over curved surface, the Young- Laplace equation, vapour pressure of droplets (Kelvin equation). The adsorption isotherms (Gibbs, Langmuir), BET equation, estimation of surface area. Surface active agents and their classification, Surface films on liquids, micelles, thermodynamics of micellization-phase separation and mass action models, solubilization, micro emulsion, reverse micelles. Study of surface phenomena by photoelectron spectroscopy, ESCA and Auger spectroscopy. Catalytic activity at surfaces.
Dielectric Behaviour: Dielectric polarization and solvent effect, polar molecules, Mossotti- Clausius relation and its limitations, Debye equation. Dipole moment and molecular structure. Intermolecular forces: attraction and repulsion potentials, van der Waals, Keesom, Debye and London forces and their relative contributions; Lennard-Jones potential. Hydrogen bonding. Onsager reaction field, dielectric effects on absorption and emission spectra. Lippert equation.

UNIT-IV: **Molecular spectroscopy, structure and properties**
Molecular spectroscopy: Introduction, elementary idea about spectroscopic instrumentation, spectral broadening. Electromagnetic spectrum and molecular processes associated with the regions. Rotational spectra of polyatomic molecules: classification of molecules into spherical, symmetric and asymmetric tops; linear triatomic molecules, Non-rigid rotor. Elementary idea of Stark effect. Anharmonic oscillator and dissociation. Elementary idea of Born-Oppenheimer approximation. Vibration rotation spectra for diatomic molecule, P-, Q-, R-branches of the vib- rotor spectrum. Rotational-vibrational coupling. Raman spectra: classical theory of Raman scattering, concept of polarizability ellipsoid. The 'Raman effect' and its salient experimental features. The classical and quantum explanation of the 'Raman effect'. Interpretation of Raman spectra of diatomic molecules.

CCS 404- LIST OF ORGANIC CHEMISTRY PRACTICALS (Credit-2)

Experiment-1: Chemical separation of organic compounds and Identification.

Experiment-2: Separation, purification and identification of organic compounds in binary mixtures (two solids, one solid + one liquid) using TLC, PC, column chromatography, chemical tests, UV-, IR- spectral measurements as required.

Experiment-3: Preparation of organic compounds by typical organic reactions, purification and characterization of the product [by re-crystallization, TLC, PC, determination of R_f value as required, m.p/b.p. , UV, IR spectra (as applicable)]:

SET I:

Oxidation: Adipic acid from cyclohexanol (by chromic acid oxidation).

Grignard reaction: Triphenylcarbinol from benzoic acid.

Aldol condensation: Dibenzal acetone from acetone and benzaldehyde.

Sandmeyer reaction: p-Chlorotoluene from p- toluidine.

Cannizzro reaction: Using p chlorobenzaldehyde as the substrate.

Fridel-Craft reaction: β-Benzoylpropeonic acid from succinic anhydride and benzene.

Acetoacetic ester condensation: Ethyl n butylacetoacetate from ethylacetoacetate.

Aromatic electrophilic substitution: p Nitroaniline from p-

bromoaniline. *Parkin reaction*: Cinnamic acid from benzalehyde

and potassium acetate. **SET II:**

1. *Oxidation* of benzylic carbon by prior protection of $-NH_2$ group in the nucleus followed by deprotection: 4-Aminotoluene 4-Aminobenzoic acid

2. *Preparation of imide* followed by *Hofmann degradation*: Phthalic anhydride Anthranilic
acid

3. *Reductive removal* of aromatic amino group by prior diazotization followed by *Sandmeyer reaction*: Anthranilic acid o Chlorobenzoic acid.

4. *Nitration* of aromatic ester followed by hydrolysis: Methylbenzoate ----------3-Nitrobenzoic
acid

5. *Oxidation* of α–hydroxyketone to diketone followed by rearrangement: Benzoin Benzilic
acid.

6. *1,4-Dihydropyridine ring generation*: Ethyl acetoacetate -------- 2,6-Dimethyl-3,5-dicarbethoxy-1,4-dihydropyridine.

7. *Partial reduction* of aromatic dinitro compound: m-Dinitrobenzene --------m-Nitroaniline.

8. *Benzoylation* of amino group in presence of carboxylic acid group: Glycine Hippuric
acid.

9. *Reduction* of a hydroxycarboxylic acid with HI and red P: Benzilic acid---------

Diphenylacetic acid.

CCS 405- LIST OF INORGANIC CHEMISTRY PRACTICALS (Credit-2)

Experiment-1: Spectrophotometric Estimations:

(i) Fe^{III} as $[Fe^{III}(SCN)^{2+}]$ complex (ii) Mn as MnO_4^- (iii) Phosphate as phosphomolybdate blue complex (iv) Fe^{III} and Fe^{II} in mixture as $[Fe^{II}(1,10\text{-phenanthroline})_3^{2+}]$ complex (v) Cr_2O_7 and MnO_4^- in mixture (vi). Ti^{IV} and V^v in mixture as their H_2O_2 complexes (vii). Cu^{II} and Zn^{II} as their PAR complexes.

Estimations based on ion-exchange separation, acid base, complexometric and argentimetric titrations. Hardness of water, separation of (i) Zn^{II} + Mg^{II} (ii) Cl^- + Br^- mixtures (iii) Co^{II} + Ni^{II}
(iv) Zn^{II} + Cd^{II} (v) K^+ : H^+ : SO_4^{2-} ratio in $KHSO_4$ (vi) H^+ , Na^+, Mg^{2+} and Zn^{2+} in mixture (vii) Al^{3+}, Fe^{3+}, Co^{2+} and Ni^{2+} in mixture.

Experiment-2: Semi-Micro Qualitative Inorganic Analysis of Complex Inorganic Mixtures containing not more than six (6) inorganic radicals from the lists : (a) Cation Radicals derived from: Pb, Bi, Cu, Sb, Sn, Fe, Al, Cr, Co, Ni, Mn, Zn, Ba, Sr, Ca, Mg, Na, K and NH^{4+} ion. (b) Anion Radicals: F^-, Cl^-, Br^-, I^-, BrO_3^- , IO_3^-, SCN^-, S^{2-}, $S_2O_3^{2-}$,SO^{2-}, SO_4^{2-}, NO_2^-, NO_3^-, PO_4^{3-}, BO_3^{3-}, H_3BO_3, SiO^{2-},CrO_4^{2-}, $Cr_2O_7^{2-}$, $[Fe(CN)_6^{4-}]$, $[Fe(CN)_6^{3-}]$. (c) Insoluble Materials: $PbSO_4$,
$BaSO_4$, $SrSO_4$, $PbCrO_4$, CaF_2, SiO_2 and various silicates, SnO_2, Al_2O_3, Fe_2O_3, Cr_2O_3, AgCl, AgBr, AgI. (d) Cation radicals, anion radicals and insoluble materials derived from the following rare Elements: V, Mo, W, U, Ti, Zr, Ce, Th and Be.

Experiment-3: 1. Determination of the amount of calcium in milk powder by EDTA complexometry

2. Potassium trioxaltoferrate III: Sythesis, analysis and photochemistry.

3. Analysis of kidney stones by permanganometric titration

4. Preparation of $[Ni(NH_3)_6]^{2+}$ and its analysis by different methods

5. Estimation of iodine in iodized common salt using iodometry

6. Estimation of phosphoric acid in cola drinks by molybdenum blue method

7. Paper and column chromatography of plant pigments

CCS 415- GREEN CHEMISTRY AND ITS APPLICATIONS (Credit -2)

UNIT I: Introduction to Green Chemistry

What is Green Chemistry? Need for Green Chemistry.Goals of Green Chemistry.

Limitations/ Obstacles in the pursuit of the goals of Green Chemistry

UNIT II: Principles of Green Chemistry and Designing a Chemicalsynthesis

Twelve principles of Green Chemistry, solvent-free organic reactions. Green solvents–water,

super critical fluids as a solvent for organic reactions, ionic liquids. Energy requirements for

reactions – alternative sources of energy: use of microwaves and ultrasonic energy

UNIT III: Examples of Green Synthesis/ Reactions and some real world cases

Green Synthesis of the following compounds: adipic acid, catechol, disodium iminodiacetate

(alternative to Strecker synthesis). Microwave assisted reactions in water: Hofmann

Elimination, methyl benzoate to benzoic acid; microwave assisted reactions in organic

solvents: Diels-Alder reaction and Decarboxylation reaction. Ultrasound assisted reactions:

sonochemical Simmons-Smith Reaction, Cannizaro reaction, Strecker synthesis,

Reformatskyreaction

UNIT IV: Future Trends in Green Chemistry

Oxidation reagents and catalysts; Biomimetic multifunctional reagents; Green chemistry in sustainable development.

CCS 547- BIOPHYSICAL CHEMISTRY (Credit-2)

UNIT I: The primary, secondary, tertiary and quaternary structures of proteins and enzymes. Function of proteins and enzymes. Nucleic acids: DNA, RNA, helix-coil transition, A, B and Z conformations. Free energy changes in biological reactions: ATP-ADP inter-conversion.

UNIT II: Biopolymer interactions – electrostatic, hydrophobic and dispersion forces. Multiple equilibria involving various types of binding processes. Thermodynamic aspects of biopolymer solutions – osmotic pressure, membrane equilibrium, muscular contraction, energy generation in mitochondrial system. Structures and functions of the cell membrane, ion-transport across biological membranes, muscle contraction and nerve function.

Application of fluorescence spectroscopy in elucidating the structure and function of biomolecules.