Master of Science
in
Chemistry

(Organic Chemistry)

Course Structure and Syllabus

For students admitted from academic year 2022-23 onwards

Under Choice Based Credit System (CBCS)

(Regulations: R22)

Department of Chemistry
Krishna University
Machilipatnam – 521 003
Andhra Pradesh

VISION

- ❖ Toimpartskill-orientedknowledgeinthebasicandadvancedchemical Sciences ready to serve academics,industryandresearch.
- ❖ To Bridge the gap between industry and academia.
- ❖ Todevelop awareness in advancedcharacterizationfacilitiesforcuttingedgeresearch
- ❖ Tothrivefortransformationoflaboratoryresearchtowardsindustrialscalesoastoacquiresu pportfromtheindustry.
- ❖ To strive for all round development of students for attainment of scientific empowerment both in teaching and research.
- ❖ To establish multi-institutional, interdisciplinary and international collaborations in thrust areas of scientific research so as to acquire national and international recognition.

MISSION

- ❖ Dissemination of knowledge through research-based teaching and learning processes with a motive to inculcate strong research attitude in student community.
- ❖ Build good character and educate students so as to become enlightened individuals, improving the living standards of their families and society.

PROGRAMME OBJECTIVES

- ❖ Train the basic concepts in core areas of Chemistry in particular, synthesis, Purification, characterization andanalysis along with experimental skills.
- ❖ To provide skill-based quality higher education by imparting knowledge with the critical and creative analysis and enhance problem-solving skills of students.
- ❖ Undertake small academic and/or research projects in the area of chemistry and write /present a technical report/document.
- ❖ Prepare the students with a working knowledge of experimentaltechniques required to work independently.
- ❖ Strengthen student's capability in organizing and presenting the acquired knowledge both in oral and written discourse.

PROGRAMME OUTCOMES

- ❖ Acquire knowledge and understanding of fundamental concepts, principles and theories related to the identified subject areas.
- ❖ Developexperimentalskillstoproduceskilloriented humanresourcestothenation.
- ❖ Develop skills to interpret and explain the limits of accuracy of experimental data in terms of significance and underlying theory.
- ❖ Demonstrate written and oral communication skills for dissemination of scientific results in report, article, or oral presentation formats, which helps to develop his/her professional development.
- ❖ To prepareself-motivated humanresourcesfor the promotion of theinnovations.

COURSE STRUCTURE AND REQUIREMENTS FOR M.Sc., CHEMISTRY (REGULATION: R22)

1	Title of the Course	M.Sc., Chemistry (Organic Chemistry)
2	Duration of the course	2 years (Four Semesters)
3	Eligibility criteria for admission	The candidate seeking admission in to M.Sc., Chemistry course should have passed a Bachelor's Degree examination not less than three years duration in any discipline with chemistry at 10+2 level or should have passed Bachelor's Degree Examination not less than three years duration in any discipline with chemistry as one of the subjects.
4	Level of the Course	Post Graduate
5	Mode of Admission	The mode of admission is through KRUCET conducted by Krishna University or any other alternative entrance test approved by the academic senate of Krishna University.
6	Objectives of the course	The Objective of M.Sc.,Chemistry course is to provide skilled human resources useful for the nation byimparting knowledge in basic concepts in core areas of Chemistry as well as recent advances in chemistry, skill oriented training in laboratory with an aim to make students ready for advanced research.
7	Course Requirement	The course shall include theory (core as well as noncore, open electives, specializations) papers, Laboratories, Assignments, Tests, Seminars and industrial Project Work.
8	Number of working days	In each semester at least ninety (90) working days must be dedicated for theory classes, practical classes and seminars/project work.

KRISHNA UNIVERSITY::MACHILIPATNAM
COURSE STRUCTURE FOR M.Sc., CHEMISTRY
UNDER CHOICE BASED CREDIT SYSTEM (CBCS)
w.e.f. 2022-23 (R22 Regulations)

I SEMESTER

Course Code	Course Name	Teaching Hours/ week			CORE	Internal Marks	External Marks	No. of Credits
		L	P	T				
OCH 101	General Chemistry	4	0	0	Core	30	70	4
OCH102	Organic Chemistry	4	0	0	Core	30	70	4
OCH103	Inorganic Chemistry -1	4	0	0	Core	30	70	4
OCH 104	Physical Chemistry –1	4	0	0	Core	30	70	4
OCH 105	Personality Development through Life Enlightenment Skills	3	1	0	Core	30	70	3
OCH 106	Organic Chemistry Lab-1	0	6	0	Core	30	70	3
OCH 107	Inorganic Chemistry Lab	0	6	0	Core	30	70	3
TOTAL FOR FIRST SEMESTER						**210**	**490**	**25**

II SEMESTER

Course Code	Course Name	Teaching Hours/ week			CORE / DSE/SEC	Internal Marks	External Marks	No. of Credits
		L	P	T				
OCH 201	Organic Spectroscopy	4	0	0	Core	30	70	4
OCH 202	Physical Chemistry -2	4	0	0	Core	30	70	4
OCH 203	Inorganic Chemistry -2	4	0	0	Core	30	70	4
OCH 204	Research Methodology& IPR	3	1	0	SEC	30	70	3
DOMAIN SPECIFIC ELECTIVE COURSES (CHOOSE ANY ONE)								
OCH 205	Heterocyclic Chemistry	4	0	0	DSE	30	70	4
OCH 206	Chemistry of Bioorganic compounds	4	0	0	DSE	30	70	4
OCH 207	Polymer Chemistry	4	0	0	DSE	30	70	4
LAB PRACTICALS								
OCH 208	Organic Chemistry lab-2	0	6	0	Core	30	70	3
OCH 209	Physical Chemistry lab	0	6	0	Core	30	70	3
TOTAL FOR SECOND SEMESTER						**210**	**490**	**25**

At the end of 2nd semester, every student must undergo summer Internship/ Apprenticeship/Project work/Industrial training/Research based Project work for Six weeks and must prepare a report concerned as per approved project guidelines, and submit the same to the University 14 days before the commencement of third semester end examinations.

L – Lecture, T- Tutorial & P – Practicals

III SEMESTER

Course Code	Course Name	Teaching Hours/ week			CORE / ID/DS/ SE/OE/ MOOCS	Internal Marks	External Marks	No. of Credits
		L	P	T				
OCH 301	Organic Reactions and Mechanisms	4	0	0	Core	30	70	4
DOMAIN SPECIFIC ELECTIVE COURSES (CHOOSE ANY THREE)								
OCH 302	Modern Organic synthesis	4	0	0	DSE	30	70	4
OCH 303	Organometallic Chemistry	4	0	0	DSE	30	70	4
OCH 304	Chemistry of Natural Products	4	0	0	DSE	30	70	4
OCH 305	Organic Photo chemistry and pericyclic reactions	4	0	0	DSE	30	70	4
OCH 306	Retrosynthetic analysis	4	0	0	DSE	30	70	4
OCH 307	Biological Chemistry	4	0	0	DSE	30	70	4
LAB PRACTICALS								
OCH 308	Organic Chemistry Lab-3	0	6	0	Core	30	70	3
OCH 309	Organic Chemistry Lab-4	0	6	0	Core	30	70	3
OPEN ELECTIVE (INTERDISCIPLINARY/MULTIDISCIPLINARY) COURSES (CHOOSE ANY ONE)								
OCH 310	Chemistry in daily life	3	0	0	OEC	30	70	3
OCH 311	Environmental Chemistry	3	0	0	OEC	30	70	3
OCH 312	Techniques for modern industrial application	3	0	0	OEC	30	70	3
TOTAL FOR III SEMESTER						**210**	**490**	**25**

IV SEMESTER

Course Code	Course Name	Teaching Hours/ week			CORE/ID /DS/S/OE/ MOOCS	Internal Marks	External Marks	No. of Credits
		L	P	T				
OCH 401	Advanced Organic Spectroscopy	4	0	0	Core	30	70	4
DOMAIN SPECIFIC ELECTIVE COURSES (CHOOSE ANY THREE)								
OCH 402	Medicinal Chemistry	4	0	0	DSE	30	70	4
OCH 403	Chemistry of Nanomaterials	4	0	0	DSE	30	70	4
OCH 404	Green Chemistry	4	0	0	DSE	30	70	4
OCH 405	Supramolecular Chemistry	4	0	0	DSE	30	70	4
OCH 406	Reagents in organic synthesis	4	0	0	DSE	30	70	4
OCH 407	Molecular modelling	4	0	0	DSE	30	70	4
LAB PRACTICALS								
OCH 408	Organic Chemistry Lab -5	0	6	0	Core	30	70	3
ENTREPRENURAL & INNOVATION/IT SKILL RELATED TO DOMAIN SPECIFIC ELECTIVE COURSES (CHOOSE ANY ONE)								
OCH 409	Drug Design and Drug Chemistry	3	0	0	SEC	30	70	3
OCH 410	Energy, environment and soil Chemistry	3	0	0	SEC	30	70	3
OCH 411	Catalysis for organic synthesis	3	0	0	SEC	30	70	3
*** CHOOSE MOOCs FROM SWAYAM/NPTEL SOURCES**								
OCH 412	Swayam/ NPTEL or Equivalent							4
OCH 413- PROJECT WORK EVALUATION AND VIVA-VOCE							100	4
TOTAL FOR IV SEMESTER						**180**	**520**	**30**

L – Lecture, T- Tutorial & P – Practical

Note: Students may be allowed to register and appear for MOOCS from the third semester itself. However, students are to complete the MOOCS successfully and submit pass certificate of the same to the University through the Principal of the College concerned for approval and endorsement of the same on grade cards and PCs and ODs as per the regulations of the University.

KRISHNA UNIVERSITY, MACHILIPATNAM - 521003DEPARTMENTOFCHEMISTRY

M.Sc.,CHEMISTRY(ORGANICCHEMISTRY)

ISEMESTER

PaperCode& Title:OCH 101:GENERALCHEMISTRY

No.ofhoursperweek:04 **Totalcredits:04**

Totalmarks: 100 **(Internal:30M&External:70M)**

Course LearningObjective(S): The main objective of this paperis to educatestudentsonTitrimetricAnalysis,Treatmentofanalyticaldata,Adsorption,Partition,GasChromatographyandHigh-PerformanceLiquidChromatography.

Unit-I:Analyticaldata: Accuracyandprecision-Classificationoferrors-DeterminateandIndeterminateerrors-Minimizationoferrors-AbsoluteandRelativeerrors,propagationoferrors-DistributionofIndeterminateerrors-Gaussiandistribution-Measuresofcentral tendency-Measures of precision- Standard deviation-Standard error of mean- student's t-test- Confidence interval of mean- Testing for significance-Comparison of two means- F-test-Criteriaofrejectionofanobservation-Significantfiguresandcomputationrules.

Unit-II:TitrimetricAnalysis: Classificationofreactionsintitrimetricanalysis – a) acid base titrations, b)redox titrations, Fe (II) with Ce (IV), precipitation titrations-silver estimation, Volhard'smethod-Mohr'smethod, complexometric titrations- calcium magnesium estimations by EDTA, Theory of indicators-Precipitationtitrations-Indicatorsforprecipitationtitrations.

Unit-III: Methods of purification: 1. Distillation: Basic principles, Distillation types-continuousdistillation,batchdistillation,fractionaldistillation,vacuumdistillationandsteam distillation.Industrial applications; **2.DryingTechniques**:Dryingof Hydrocarbons, ethers and alcohols, Tetrahydrofuran,DMF and DMSO**;3.Solventextraction:** Basic principles, Different types of extraction. Selection of solvents. Avoiding emulsionformation.BasicconceptsonSoxhletextraction.Industrial applications**;4.Recrystallization**:Basic principles, choice of solvent, seeding,filtration and centrifugation and drying. Industrialapplications.Conceptsoffractionalcrystallization.

Unit-IV:Principles of Chromatography: Introductiontochromatography,Different types of Chromatography: **Adsorptionchromatograph:** adsorbents, solvents, solutes,apparatus;**ColumnChromatography:**stationaryphase,Mobilephase,packingofcolumn,advantagesanddisadvantages.**Paperchromatography:**BasicPrinciples.Ascendinganddescendingtypes.Selectionofmobilephase,Developmentofchromatograms,Visualizationmethods.Application of paper chromatography in the identification of sugars and aminoacids.One- and two-dimensional paper chromatography; **Thin Layer chromatography:** Basic Principles.Commonstationaryphases,MethodsofpreparingTLCplates,DevelopmentofTLCplates,Visualization methods, Rf value. Application of TLC in monitoring organic reactions. identificationandquantitativeanalysis.

Unit-V:GasChromatographyAndHigh-PerformanceLiquidChromatography:Gaschromatography: Basic Principles. Different types of GC techniques. Selection of columns andcarrier gases.Instrumentation. detectors; RT values. Applications in the separation, identificationandquantitativeanalysisof organiccompounds;**HighPerformanceliquidchromatography(HPLC):** Basic Principles. Normal and reversed Phases. Selection of column and mobile phase.Instrumentation.detectors;RTvalues.Applicationsintheseparation,identificationandquantitative

estimationoforganiccompounds.ConceptsonHPLCmethoddevelopment, Principles of Preparative HPLC and Flash Chromatography.

Course Learning Outcome(S): After studying this paper, students will acquire the knowledge ofpurification methods, Titrimetric Analysis, Treatment of analytical data, Adsorption, Partition, Gas Chromatography andHigh-PerformanceLiquidChromatography.

Textbooks/Referencebooks:

1. Vogel'stextbookofquantitativeanalysis.AdditionWesleyLongmannInc.
2. Quantitativeanalysis R.ADayandA.L. Underwood. PrenticeHallPvt. Ltd.
3. PrinciplesofInstrumentalAnalysisbyD.A.Skoog,F.J.HollerandT.A.Nieman,HarcourtCollege Pub.
4. SeparationTechniquesbyM.N.Sastri,Himalaya PublishingHouse(HPH),Mumbai.
5. Chromatography,E.Helftnan,VanNostrand,Reinhold,NewYork.
6. Chromatography,E.LedererandM.Lederer,Elsevier,Amsterdam.
7. Thinlayerchromatography,E.Stahl,AcademicPress,NewYork.
8. IntroductiontoOrganicLaboratoryTechniques-D.L.Pavia,G.M.Lampman,G.S.KrizandR. G.Engel, SaundersCollegePub(NY).
9. InstrumentalmethodsofChemicalAnalysisbyH. Kaur,PragatiPrakasan,Meerut.
10. Protein Purification-Principles and practice,III Edn-R.K.Scopes,Narosa Publishing House,Delhi.
11. D.D.Perrin ; Purification of Laboratory Chemicals

KRISHNA UNIVERSITY, MACHILIPATNAM - 521003DEPARTMENTOFCHEMISTRY

M.Sc.,CHEMISTRY(ORGANICCHEMISTRY)ISEMESTER

PaperCode&Title:OCH102:ORGANICCHEMISTRY-I

No.ofhoursperweek:04 **Totalcredits:04**

Totalmarks: 100 **(Internal:30M&External:70M)**

Course Learning Objective(S): The main objective of this paper is to give a basic and updatedknowledgeon Natureofbonding,Aromaticityandorganic reactionmechanism.

Unit-I: Nature of bonding, Aromaticity and Reactive intermediates: Nature of bonding: Inductive effect, Mesomericeffect(Resonance),localizedanddelocalizedcovalentbonds,conjugation,crossconjugation, Hyperconjugation, Steric effects, Tautomerism and their applications. **Aromaticity:** Aromaticity inbenzenoidnon-benzenoidcompounds,Benzene,Cyclobutadiene,Tropylliumcation,1,3,5,7-Cyclooctatetraene,aromaticityofHetero-aromaticSystems,anti-aromaticityandhomo-aromaticity, pseudo aromaticity.**Reactiveintermediates :**Generation, reactivity and stability of Carbocations, Carbanions, Free radicals, Carbenes,NitrenesandArynes.

Unit-II: Substitution Reactions: Aliphatic Nucleophilic Substitution Reactions: The S_N2 , S_N1 ,mixed $S_N1$and $S_N2$reactions, S_Ni and their mechanisms, Neighboring Group Participation,Anchimericassistance.**Aromatic Electrophilic substitution**, Nitration , alkylation, acylation, $_N$ sulphonation and halogenation,Directing groups. **AromaticNucleophilicsubstitutionReactions:**S_N2(Ar)(Addition–Elimination),S_N1(Ar)andbenzynemechanisms(Elimination-Addition).

Unit-III:AdditionReactions and Elimination Reactions: Additionreactionsinvolving electrophiles,nucleophiles andfree radicals,regioand chemoselectivity,orientationandreactivity,Hydrogenationofdoubleandtriplebonds,hydrogenationofaromaticrings,Hydroboration.Elimination Reactions:Type of elimination reactions, mechanisms, Stereochemistry andOrientation,Hofmann andSaytzeff rules,Synelimination versusanti-elimination,competitionbetweeneliminationandsubstitution,dehydration,dehydrogenation,dehalogenation,decarboxylative eliminationsandpyrolytic eliminations**.**

Unit IV: Named reactions: Definition, mechanism, and synthetic applications ofAldol condensation, Benzoin condensation, Cannizzaro condensation, Dieckmann condensation,Perkin condensation, Stobbe condensation, Mannich reaction, Reimer-Tiemann reaction, Vilsmeier-Haackreaction,McMurrayreaction,Michaeladditionreaction,Oppenauroxidation reaction, Clemmensen reduction reaction, wolf kishner reduction, Meerwein–Ponndorf–Veriey reduction reaction, Birch reduction reaction.

Unit-V: Stereo Chemistry:

Chirality,Definitionandclassificationof Stereoisomers,Enantiomer,Diastereomer,Homomer,Epimer,Anomer,ConfigurationandConformation,Configurationalnomenclature:D,LandR,Snomenclature.Molecular representation of organicmolecules:Fischer, Newman and Sawhorseprojections and their inter-conversions. Geometrical Isomerism. Cis-trans, E, Z- and Syn and antinomenclature.

Course Learning Outcome(S): After studying this paper, students will acquire the knowledge ofNatureofbonding,Aromaticityandorganicreactionmechanism.

Textbooks/Referencebooks:

1. Advancedorganicchemistry-Reaction,mechanismandstructure,JerryMarch,JohnWiley.
2. Advancedorganicchemistry,F.A. CareyandR.J. Sundberg,Springer, NewYork.
3. AguidebooktoMechanism inorganicchemistry,PeterSykes,Longman.
4. Organicchemistry,I.L.Finar,Vol. I,Fifthed.ELBS.
5. Organicchemistry,Hendrickson,CramandHammond(McGraw–Hill).
6. ModernorganicReactions,H.O.House,Benjamin.
7. Structureandmechanisminorganicchemistry,C.K.Ingold, CornellUniversityPress.
8. Principlesoforganicsynthesis,R.O.C.NormanandJ.M.Coxon,BlakieAcademic&Professional.
9. ReactionMechanisminOrganicChemistry, S.M.MukherjiandS.P.Singh,Macmillan.
10. BasicPrinciplesofOrganicChemistrybyJ.B.Robertsand M.Caserio.
11. Organic chemistry by Morrison and Boyd

KRISHNA UNIVERSITY, MACHILIPATNAM - 521003DEPARTMENTOFCHEMISTRY
M.Sc.,CHEMISTRY(ORGANICCHEMISTRY)
ISEMESTER
PaperCode& Title:OCH 103:INORGANICCHEMISTRY-I

No.ofhoursperweek:04 **Totalcredits:04**

Totalmarks: 100 **(Internal:30M&External:70M)**

Course Learning Objective(S): The main objective of this paper is to impart updatedknowledge to students on Introduction to Exact Quantum Mechanical Results, Chemistry of non-transition elements, Structure & Bonding, Metal–ligand bonding, and Metal – ligand Equilibria insolutions.

Unit-I: StructureandBonding:pπ-dπbonding,Bent'srule,Non-valencecohesiveforces,VSEPR theory and limitations, Molecular Orbital theory, Bond order, Symmetry of Molecular orbitals, Molecular orbitals intriatomic (BeH_2) molecules and ions (NO_2^-) and energy level diagrams. Walsh diagrams for linear(BeH_2)andbent(H_2O)molecules.

Unit II: Metal–ligand bonding: Crystal Field Theory of bonding in transition metal complexes-Splitting of d-orbitals in octahedral, tetrahedral, square planar and Trigonal bipyramidal and Squarepyramidal fields, strong and week field ligands. Tetragonal distortions - Jahn-Teller effect. Applications and limitations of CFT.Experimental evidencesfor covalencein complexes. Molecular Orbital Theory of bonding forOctahedral, tetrahedral and square planar complexes. π-bonding and MOT - Effect of π - donor andπ -acceptorligandsonΔo.Experimentalevidenceforπ-bondingincomplexes.

Unit III: Metal – ligand Equilibria insolutions: Step wise and over all formation constants.Trends in stepwise constants (statistical effect and statistical ratio). Determination of formationconstantsbySpectrophotometricmethod(Job'smethod)andpHmetricmethod(Bjerrum's).Sta bility correlations - Irwing -William's series, Hard and soft acids and bases (HSAB)Principle, Acid-basestrengths.

Unit IV: Chemistry of non- transition elements: Inter halogen compounds, Halogen oxides andoxyfluorides, Clathrate compounds, Spectral and Magnetic properties of Lanthanides and Actinides.Analytical applications of Lanthanides and Actinides. Synthesis, properties and structure of B-N, S-N,P-Ncycliccompounds.Intercalationcompounds.

Metal π- complexes: preparation, structure and bonding in Nitrosyl, Dinitrogen and Dioxygencomplexes.

Unit V: Coordination Chemistry : Nomenclature of ligands, Nature and types of ligands, metal complexes, coordination speheres, Werners theory , isomerism in coordination complexes and spectrochemical series.

Course Learning Outcome(S): After studying this paper, students will acquire the knowledge ofIntroductiontoExactQuantumMechanicalResults,Chemistryofnon-transitionelements,Structure&Bonding,Metal–ligand bonding,andMetal– ligand Equilibriainsolutions.

Textbooks/Referencebooks:

1. InorganicChemistryHuheey, Harper andRow.
2. Physicalmethodsininorganicchemistry,R.S.Drago.AffliatedEast-WestPvt. Ltd.
3. Concise inorganicchemistry,J.D.Lee,ELBS.
4. ModernInorganicChemistry,W.L.Jolly,McGrawHill.
5. InorganicChemistry,K.F.PurcellandJ.C.KotzHoltSaundersinternational.
6. Conceptsandmethodsofinorganicchemistry,B.E.DouglasandD.H.M.C.Daniel,oxfordPress.
7. InorganicChemistry,Atkins,ELBS.
8. AdvancedInorganicChemistry,CottonandWilkinson,WileyEastern.
9. TextbookofCoordinationchemistry,K.SomaSekharaRaoandK.N.K.Vani,KalyaniPublishers.
10. Inorganic Chemistry by AK Das
11. Selected topics in inorganic chemistry by Madan, Mallik and Tuli

KRISHNA UNIVERSITY, MACHILIPATNAM - 521003DEPARTMENTOFCHEMISTRY
M.Sc.,CHEMISTRY(ORGANICCHEMISTRY)
ISEMESTER
PaperCode& Title:OCH 104:PHYSICALCHEMISTRY-I

No.ofhoursperweek:04 **Totalcredits:04**

Totalmarks: 100 **(Internal:30M&External:70M)**

Course Learning Objective(S): The main objective of this paper is to give a basic and updatedknowledgeforstudentsonThermodynamics,Surfacephenomenaandphaseequilibria,Electrochemistry,ChemicalkineticsandMicrowaveSpectroscopyandRotationalVibrationalSpectroscopy.

Unit-I: Quantum Mechanics: Schrodinger equation, importanceof wave function, Operators, Eigen values and Eigen functions, derivation of wave equation usingoperator concept. Discussion of solutions of Schrodinger's equation to some model systems viz.particle in one dimensional box applications.

Unit II Thermodynamics: Classical thermodynamics - Brief review of firstand second laws ofthermodynamics - Entropy change in reversible and irreversible processes - Entropy of mixing ofideal gases - Entropy and disorder – Free energy functions - Gibbs-Helmholtz equation - Maxwellpartial relations.Conditions of equilibrium and spontaneity - Free energy changes in chemicalreactions, Van't Hoff reaction isotherm - Van't Hoff equation – Classiuss - Clapeyron equation -partial molar quantities - Chemical potential - Gibbs- Duhem equation - partial molar volume -determination of partial molar quantities - Fugacity - Determination of fugacity - ThermodynamicderivationofRaoult'slaw.

Unit-III: Chemical kinetics: Methods of deriving rate laws - complex reactions - Rate expressionsfor opposing, parallel and consecutive reactions involving unimolecular steps. Theories of reactionrates-collision theory -Stericfactor-Activatedcomplex theory -Thermodynamicaspects– Unimolecularreactions-Lindemann'stheory-Lindemann-Hinshelwoodtheory.Primaryandsecondarysalteffects.Elementaryaccountoflinearfreeenergyrelationships-Hammet–Taft

Unit IV: Surface phenomena and phase equilibria: Surface tension - capillary action – pressuredifference -across curved surface (young - Laplace equation) - Vapour pressure of small droplets(Kelvinequation)-Gibbs-Adsorptionequation-BETequation-Estimationofsurfacearea-catalytic activity of surfaces - ESCA, X- ray fluorescence and Auger electron spectroscopy. **Surfaceactiveagents**-classificationofsurface-activeagents-Micellization–criticalMicelleconcentration(CMC)-factorsaffectingtheCMCofsurfactants,Microemulsions-Reversemicelles.

Unit-V: Electrochemistry-1: Electrochemical cells - Measurement of EMF - Nernst equation – Equilibrium constant from EMF Data - pH and EMF data -Determination of solubility product fromEMF measurements.Concentration cells with and without transference – Liquid junction potentialandits determination -Activity andactivity coefficients - Debye Huckel limitinglaw anditsverification. Effect of dilution on equivalent conductance of electrolytes - Anomalous behavior of strongelectrolytes.DebyeHuckel-Onsagarequation-verificationandlimitations-Bjerrumtreatmentofelectrolytes.

Course Learning Outcome(S): After studying this paper, students will acquire the knowledge ofThermodynamics,Surface phenomena and phaseequilibria,Electrochemistry,Chemical kineticsandMicrowaveSpectroscopyandRotationalVibrationalSpectroscopy.

Textbooks/Referencebooks:

1. IntroductoryquantumMechanics,A.K. Chandra.
2. QuantumChemistry,R.K. Prasad PhysicalChemistryP.W.Atkins,ELBS.
3. ChemicalKinetics- K.J. Laidler, McGrawHillPub.
4. TextBookofPhysicalChemistry.SamuelGlasstone,McmillanPub.
5. PhysicalChemistry,G.W.Castellan.NarosaPublishingHouse
6. ThermodynamicforChemists.SamuelGlasstone.
7. Electrochemistry,SamuelGlasstone,AffiliatedEast West
8. PhysicalChemistry, W.J.Moore,PrenticeHall
9. Atomicstructureandchemicalbond. Manaschanda. TataMcGrawHillCompanyLimited.

KRISHNA UNIVERSITY, MACHILIPATNAM - 521003

DEPARTMENTOFCHEMISTRY

M.Sc.,CHEMISTRY(ORGANICCHEMISTRY)

ISEMESTER

PaperCode& Title:OCH 105:PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

No.ofhoursperweek:04 **Totalcredits:04**

Totalmarks: 100 **(Internal:30M&External:70M)**

Course Objectives:

The Course will introduce the students to

- Learn to achieve the highest goal happily.
- Become a person with stable mind, pleasing personality and determination.
- Learn to build positive attitude, self-motivation, enhancing self-esteem and emotional intelligence
- Learn to develop coping mechanism to manage stress through Yoga and meditation techniques
- Awaken wisdom among them.

UNIT- I: Introduction to Personality Development

The concept of personality - Dimensions of Personality – Theories of Personality development (Freud & Erickson) – The concept of Success and Failure – Factors responsible for Success –Hurdles in achieving Success and Overcoming Hurdles — Causes of failure – Conducting SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis.

UNIT- II:Attitude, Motivation and Self-esteem

Conceptual overview of Attitude – Types of Attitudes – Attitude Formation – Advantages/ Disadvantages of Positive/Negative Attitude - Ways to Develop Positive Attitude **Concept of motivation:** Definition and Nature of Motivation/Motive – Internal and external motives – Theories of Motivation – Importance of self-motivation- Factors leading to de- motivation.

Self-esteem - Definition and Nature of self-esteem – Do's and Don'ts to develop positive self- esteem – Low self-esteem - Personality having low self-esteem - Positive and negative self-esteem.

UNIT -III:Other Aspects of Personality Development

Body language - Problem-solving - Conflict Management and Negation skills - Decision-making skills - Leadership and qualities of a successful leader – Character building -Team-work – Time management - Work ethics – Good manners and etiquette – Emotional Ability/Intelligence – Dimensions of Emotional Intelligence – Building Emotional Intelligence.

UNIT- IV:Neetisatakam-Holistic Development of Personality

Verses- 19,20,21,22 (wisdom) – Verses- 29,31,32 (pride and heroism) – Verses- 26,28,63,65 (virtue)

Personality of Role Model – Shrimad Bhagwadgeeta

Chapter2-Verses 17, Chapter 3-Verses 36,37,42 – Chapter 4-Verses 18, 38,39 Chapter18 –
Verses 37,38,63

UNIT -V: **Yoga & Stress Management**

Meaning and definition of Yoga - Historical Perspective of Yoga - Principles of Astanga Yoga by Patanjali – Meaning and Definition of Stress - Types of Stress - Eustress and Distress –Stress Management – Pranayama-Pranayama: Anulom and Vilom Pranayama - Nadishudhi Pranayama– Kapalabhati-Pranayama - Bhramari Pranayama - Nadanusandhana Pranayama – Meditation techniques: Om Meditation - Cyclic meditation : Instant Relaxation technique (QRT), Quick Relaxation Technique (QRT), Deep Relaxation Technique (DRT) (Theory & Practical).

Learning Outcomes:

At the end of this course the students should be able to:

- Develop their personality and achieve their highest goals of life.
- Lead the nation and mankind to peace and prosperity
- Practice emotional self regulation.
- Develop a positive approach to work and duties
- Develop a versatile personality

Text and Reference Books:

1. Hurlock, E.B. Personality Development, 28th Reprint. New Delhi: Tata McGraw Hill, 2006.
2. Gopinath,Rashtriya Sanskrit Sansthanam P, Bhartrihari"sThreeSatakam, Niti-sringar- vairagya, New Delhi, 2010
3. Swami Swarupananda, Srimad Bhagavad Gita, AdvaitaAshram,Publication Department, Kolkata, 2016.
4. Lucas, Stephen. Art of Public Speaking. New Delhi. Tata - Mc-Graw Hill. 2001
5. Mile, D.J Power of positive thinking. Delhi. Rohan Book Company, (2004).
6. Pravesh Kumar. All about Self- Motivation. New Delhi. Goodwill Publishing House. 2005.
7. Smith, B . Body Language. Delhi: Rohan Book Company. 2004
8. Yogic Asanas for Group Training - Part-I: Janardhan Swami Yogabhyasi Mandal, Nagpur.
9. Rajayoga or Conquering the Internal Nature by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata.
10. Nagendra H.R nadNagaratna R, Yoga Perspective in Stress Management, Bangalore, Swami Vivekananda Yoga Prakashan.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc16_ge04/preview
2. https://freevideolectures.com/course/3539/indian-philosophy/11

KRISHNA UNIVERSITY, MACHILIPATNAM - 521003DEPARTMENTOFCHEMISTRY

M.Sc., CHEMISTR (ORGANIC CHEMISTRY)ISEMESTER

PaperCode& Title: OCH106:ORGANICCHEMISTRYLab-I

Totalmarks: 100 **(Internal:30M&External:70M)**

Course Objectives:

- To develop an insight into the preparation of organic compounds in various reactions
- To understand the process of preparation of organic molecules through various reactions
- To acquire skills in the preparation of organic compounds, their separation, purification and identification

Synthesis of Organic compounds

1. β-Napthyl methyl ether from β-Naphthol
2. m-dinitrobenzene from Nitrobenzene
3. Aromatic acid from ester
4. Benzanilide from aniline
5. p-nitroaniline from Acetanilide
6. p-Bromo acetanilide from aniline
7. Benzanilide from Benzophenone
8. PreparationofPhthalimidefromPhthalicanhydride– HighTemperature.
9. Preparationofp-nitroacetanilide–Lowtemperature.
10. PreparationofIodoform–Roomtemperature.
11. Preparation of Aspirin (Acetylation)
12. PreparationofSodiumwire-tomakeSodiumWirefor solventdrying.
13. PreparationofSodiumGranules and preparationofSodiumt-butoxide.
14. PreparationofGrignardReagentanditsusageonereaction.
15. PreparationofWittigreagent.

Learning Outcomes: At the end of the course, the learners should be able to Prepare various organic compounds using synthetic methodologies. Develop skill in handling apparatus, measure the quantities and carryout the reaction, separate the products, purify them and analyze the products formed, Applies the skill in preparing novel organic moieties

Textbooks/Referencebooks:

1. A Textbook of Practical Organic Chemistry by A. I. Vogel, ELBS and Longman group.
2. Practical Organic Chemistry by Mann and Saunders, ELBS and Longman group.
3. A.I.Vogel,"ElementaryPracticalOrganicChemistry",Longman
4. F.G.MannandB.C.Saunders,"PracticalOrganicChemistry",Longman
5. Reaction and Synthesis in Organic Laboratory, B.S. Furniss, A.J. Hannaford, Tatchell, UniversityScience Booksmillsvalley.
6. PurificationofLaboratorychemicals,manual,W.L.F.ArmaregoEDDPerrin
7. ReactionandSynthesisinOrganicChemistryLaboratory,Lutz-Friedjan-Tietze,TheophilEicher,UniversityScienceBook.
8. Laboratory manual of organic chemistry, B.B. Dey, M.V.Sitaraman and T.R. Govindachari, Allied publisher limited.

KRISHNA UNIVERSITY, MACHILIPATNAM - 521003DEPARTMENTOFCHEMISTRY
M.Sc.,CHEMISTRY(ORGANICCHEMISTRY)
ISEMESTER
PaperCode&Title:OCH107:INORGANICCHEMISTRY LAB

Totalmarks: 100 **(Internal:30M&External:70M)**

Course Objectives:

To develop an insight into the preparation of inorganic complexes

To understand the process of preparation of inorganic complexes

To acquire skills in the preparation of inorganic complexes

COURSE CONTENT:

1. **Synthesis of Inorganic Metal Complexes:**Synthesis of 3d transition metal complexes of tetrahedral, square planar and octahedral geometries.
   (i) Preparation of TetraammineCopper(II) sulphate monohydrate
   (ii) Potassium tris-oxalatoferrate (III) trihydrate
   (iii)Tris-thiourea copper(I) sulphate
   (iv)PreparationofCisandtranspotassiumdiaquodioxalatochromium(III).
   (v) PreparationofHexaamminecobalt(III)chloride.
   (vi)DeterminationofZn^{2+}withpotassiumFerrocyanide.
   (vii) DeterminationofMg^{2+} usingEDTA.
   (viii) DeterminationofNi^{2+}usingEDTA.
   (ix)Determinationofhardnessofwater using EDTA.
   (x) Gravimetric determinationofnickelusingdimethylglyoxime.
   (xi)GravimetricdeterminationofCopperusing ammoniumthiocyanate.
   (xii) GravimetricdeterminationofZnusingdiammoniumhydrogenphosphate.
2. **Systematic Semimicro Qualitative Analysis of Inorganic six radical mixtures**

In systematic Semi micro qualitative inorganic analysis, inorganic mixture containsthree cations and three anions. The analysis involves identification and conformation of cations and anions containing one less familiar cation(Tungsten, Molybdenum, Zirconium, Thorium, Titanium, Uranium, Cerium, Vanadium, Lithium, Berkelium Etc... and one interfering anion

Anions:CO_3^{2-}, S^{2-}, SO_3^{2-}, Cl^-, Br^-, I^-, NO_3^-,SO_4^{2-},CH_3COO^-, $C_2O_4^{2-}$,$C_4H_4O_6^{2-}$, PO_4^{3-},CrO_4^{2-} ,AsO_4^{3}, F^-, BO_3^{3-}

Cations : Ammonium (NH_4^+),1st group: Hg, Ag, Pb, Tl, W ; 2nd group: Hg, Pb, Bi, Cu, Cd, As, Sb, Sn, Mo; 3rd group: Fe, Al, Cr, Ce, Th, Ti, Zr, V, U, Be 4th group: Zn, Mn, Co, Ni5th group: Ca, Ba, Sr6th group: Mg,K, Li

Note: A minimum of 4 inorganic mixtures must be analysed in this Semester

Learning Outcomes:

At the end of the course, the learners should be able to:
Prepare various inorganic complexes
Develop skill in handling apparatus, measure the quantities and carryout the reaction and analyze the inorganic mixtures
Applies the skill in preparing new metal complexes and analysis of inorganic mixtures
Understand the regulations in handling and disposal of chemicals

REFERENCE BOOKS:

1. Practical Inorganic Chemistry, G. Marr and B. W. Rockett.

2. Practical Inorganic Chemistry by G.Pass H.Sutchiffe,2nd edn John Wiley & Sons.

3. Experimental Inorganic/Physical Chemistry, M. A. Malati, Horwood Publishing, Chichester, UK (1999)

4. VogelsTextBookofQuantitativeanalysis, revised.J.Bassett, R.C.Denny, G.H.JefferyandJ.Mendhan,ELBS.

5. SynthesisandCharacterizationofInorganicCompounds,W.L.Jolly.PrenticeHall.

KRISHNA UNIVERSITY, MACHILIPATNAM - 521003DEPARTMENTOFCHEMISTRY
M.Sc., CHEMISTRY (ORGANIC CHEMISTRY)
IISEMESTER
PaperCode&Title: OCH 201:ORGANICSPECTROSCOPY

No.ofhoursperweek:04 **Totalcredits:04**

Totalmarks: 100 **(Internal:30M&External:70M)**

Course Learning Objective(S): The main objective of this paper is to give a basic and updatedknowledgeforthestudentsonUV-Visiblespectroscopy,Infraredspectroscopy,^{1}HNMRSpectroscopyandMass spectrometry.

Unit-I:UV-Visiblespectroscopy: Lambert'slaw, Beer-Lambert'slaw, Instrumentation,Energytransitions–Simplechromophores-Auxochrome, Absorption shifts (Bathochromic, Hypsochromic, Hyper chromic and Hypo chromicshifts), UV absorption of Alkenes, Polyenes unsaturated cyclic systems. UV absorption of carbonylcompounds: α, β-unsaturated carbonyl systems, UV absorption of aromatic systems, solvent effects,geometrical isomerism, acid and base effects. Calculation ofλ_{max} values usingWoodward-Fieserrules with examples.

Unit-II: Infrared spectroscopy: Mechanics of measurement-Fundamental modes of vibrations-stretchingandbendingvibrations-FactorseffectingVibrationalfrequency-hydrogenbonding.Finger printregion anditsimportance, typical group frequencies for functional groups like –CH, -OH, - NH, - CC, -CO andaromaticsystems.Application instructuraldeterminations.

Unit-III: ^{1}H-NMR Spectroscopy-I: Introduction: Basic principle of NMR, Nuclear spin, nuclearresonance, saturation, Relaxation, Instrumentation. Shielding and deshielding of magnetic nuclei,chemical shiftanditsmeasurements,factors influencing chemical shift,spin-spin interactions,factorsinfluencing–couplingconstantJandfactorseffectingJvalue.

Unit-IV: ^{1}H-NMR Spectroscopy-II: Improving the PMR spectrum: Chemical and MagneticEquvalence. Chemical exchange, First and Non-First Order Spectra and analysis of AB, AMX andABXsystems.**Simplificationofcomplexspectra:**NuclearMagneticdoubleresonance,Lanthanide shift reagents, Deuterium Exchange, spectra at higherfields, solvent effects, Fouriertransformstechnique,NuclearOverhauserEffect(NOE). HinderedRotationsandRateprocesses.

Unit-V:Massspectrometry: Introduction &Intrumentation,Ionproduction-E1,C1,ES,MALDIandFAB, determinationofMolecularweight andformulae, behavioroforganiccompoundsinmassspectrometer- factors affecting fragmentation, Mass spectral fragmentation of organic compounds,Common functional groups, molecular ion peak, meta stable peak, isotopic peak, Mc Lafferty rearrangement,Nitrogen rule. Structuraldetermination of organic compounds using mass spectra.

Course Learning Outcome(S): After studying this paper, students will acquire the knowledge ofUV-Visible spectroscopy, Infrared spectroscopy, ^{1}H-NMR Spectroscopy andMass spectrometry.

Textbooks/Referencebooks:

1. IntroductiontoSpectroscopy–D.L.Pavia,G.M.Lampman,G.S.Kriz,3rdEd.(Harcourtcollege publishers).
2. SpectrometricidentificationoforganiccompoundsR.M.Silverstein,F.X.Webster,6thEd.JohnWileyandSons.
3. Spectroscopicmethods inorganicchemistry- D.H.WilliamsandI. FlemmingMc.GrawHill.
4. Absorptionspectroscopyoforganicmolecules–V. M.Parikh
5. NuclearMagneticResonance–BasicPrinciples-Atta-Ur-Rehman,Springer-Verlag(1986).
6. One- andTwo-dimensionalNMRSpectroscopy–Atta-Ur-Rehman,Elsevier (1989).
7. OrganicstructureAnalysis-PhillipCrews, Rodriguez,Jaspars,OxfordUniversityPress(1998).
8. OrganicstructuralSpectroscopy-JosephB.Lambert,Shurvell,Lightner,Cooks,Prentice-Hall(1998).
9. Organicstructuresfromspectra–FieldL.D.,KalmanJ.R.andSternhellS.4thEd.JohnWileyandsons Ltd.
10. Elementary organic spectroscopy Y R Sharma
11. Organic spectroscopy William Kemp

KRISHNA UNIVERSITY, MACHILIPATNAM - 521003DEPARTMENTOFCHEMISTRY
M.Sc.,CHEMISTRY(ORGANICCHEMISTRY)
IISEMESTER
PaperCode&Title: OCH202:PHYSICALCHEMISTRY-II

No.ofhoursperweek:04 **Totalcredits:04**

Totalmarks: 100 **(Internal:30M&External:70M)**

Course Learning Objective(S): The main objective of this paper is to give a basic and updatedknowledgefor the students on Thirdlawof Thermodynamics andStatistical thermodynamics,Polymerchemistry andRaman Spectroscopy,ElectroChemistry,Chemical kinetics andPhotochemistry,SymmetryandGrouptheoryinchemistry.

Unit-I: Third law of Thermodynamics and Statistical thermodynamics: Nernst Heat theorem - Thirdlawofthermodynamics-Itslimitations-Determinationofabsoluteentropy-Thermodynamic probability and most probable distribution, Entropy and probability - Boltzmann-Plank equation. Ensembles, Maxwell-Boltzmann distribution, Fermi-Dirac statistics, Bose Einsteinstatistics.Partitionfunction-calculation ofthermodynamicpropertiesintermsofpartitionfunction.

Unit-II:ChemicalkineticsandPhotochemistry: BranchingChainReactions-Hydrogen-oxygen reaction - lower and upper explosion limits - Fast reactions - Study of kinetics by flowmethods - Relaxation methods - Flash photolysis. Acid base catalysis –protolytic and prototropicmechanism. Enzyme catalysis - Michelis-Menten kinetics. **Photochemistry:** Joblansky diagram,Quantum yield and itsdetermination, Actinometry, Reactions with lowand high quantum yields, Photo sensitization,Exciplexes and Excimers, Kinetics of collisional quenching - Stern-Volmerequation.

Unit-III:Symmetry and Group theory in chemistry: Symmetry elements, symmetry operation,definition of group, sub group, relation between order of a finite group and its sub group. GMTtables Abelian and non-abelian groups. Point group. Schonfiles symbols, Find out Point group of amolecule (yes or no Method). Representation of groups by Matrices (representation for the Cn, Cnv,Cnh,Dnetc.groupstobeworkedout,explicitly).Characterofarepresentation.ThegreatOrthogonality theorem(withoutproof)anditsimportance.Charactertablesandtheiruse.ConstructionofCharactertables.

Unit -IV MicrowaveSpectroscopyandRotationalVibrationalSpectroscopy: Motionofmolecules-Degrees of freedom –Energy associates with the degrees of freedom Type of spectra**.**Microwavespectraofpolyatomicmolecules.**RotationalVibrationalSpectroscopy**:Harmonico scillator,vibrationalenergiesofdiatomicmolecules,zero-pointenergy,forceconstantandbondstrengths,anharmonicity Morse potential energy diagram. Vibration – rotation spectroscopy. selection rules,Classical and quantum theories of Ramaneffects,purerotational,vibrationalandVibrational-rotational Ramanspectra,selectionrules,mutualexclusionprinciple.

Unit-V: ElectroChemistry-II:,Reference electrode -Standard hydrogen electrode.Calomelelectrode-Indicatorelectrodes:Metal-metalionelectrodes-Inertelectrodes-Membraneelectrodes

- theoryofglassmembranepotential,potentiometrictitrations,Conductometric titrations. Electrode potentials - Double layer at the interface - rate ofcharge transfer - Decomposition potential - Over potential - Tafel plots - Derivation of Butler-Volmerequationforone electrontransfer-

electrochemicalpotential.

Course Learning Outcome(S): After studying this paper, students will acquire the knowledge ofThirdlaw of Thermodynamics and Statistical thermodynamics,Polymer chemistry and RamanSpectroscopy, Electro Chemistry, Chemical kinetics and Photo chemistry, Symmetry and Grouptheoryinchemistry.

Textbooks/Referencebooks:

1. Physicalchemistry,G.K.Vemulapalli(PrenticeHallofIndia).
2. Physicalchemistry, P.W.Atkins.ELBS**.**
3. Chemicalkinetics-K.J.Laidler,McGrawHillPub.
4. TextbookofPhysicalChemistry, SamuelGlasstone, Macmillanpub.
5. StatisticalThermodynamics - M.C.Gupta.
6. PolymerSceince,Gowriker,Viswanadham,Sreedhar.
7. QuantitativeAnalysis,A.I.Vogel,AddisonWesleyLongmannInc.
8. PhysicalChemistrybyG.W.Castellan, NarosaPublishingHouse,PrenticeHall.
9. PhysicalChemistrybyW.J.Moore,PrenticeHall.
10. PolymerChemistrybyBillmayer.
11. FundamentalsofPhysicalChemistrybyKK.Rohatgi-Mukherjee.WileyEasternLtdpublications.
12. StatisticalThermodynamicsbyM.Dole.
13. IntroductoryGroupTheoryforChemistsbyGeorgeDavidson.
14. Grouptheoryforchemistryby A.K.Bhattacharya.
15. FundamentalsofMolecular spectroscopybyC.N.Banwell.
16. MolecularspectroscopybyB.K.Sharma.
17. VibrationalSpectroscopybyD.N.SathyanarayanaNewAgeInt.Pub.

SpectroscopybyAruldas.

KRISHNA UNIVERSITY, MACHILIPATNAM - 521003DEPARTMENTOFCHEMISTRY
M.Sc.,CHEMISTRY(ORGANICCHEMISTRY)IISEMESTER
PaperCode&Title:OCH203:INORGANICCHEMISTRY-II

No.ofhoursperweek:04 **Totalcredits:04**

Totalmarks: 100 **(Internal:30M&External:70M)**

Course Learning Objective(S): The main objective of this paper is to give a basic and updatedknowledge for the students on Non-metal cages and metal clusters, Organometallic chemistry oftransition metals, Reaction mechanism of transition metal complexes, Term symbols and Electronicspectra andBio-inorganic chemistryandMagneticproperties ofcomplexes.

Unit-I:Non-metalcagesandmetalclusters:Structure and bondingin phosphorous-oxygen,phosphorous-Sulphur cages; structure and bonding in higher boranes with (special reference to B12icosahedra).Carboranes,metalloboranes,metallocarboranes.Classification-LNCsandHNCs**,**Isoelectronic and Isolobal relationships, electron counting rules: Jemmis rule, Wade's and Lauher's rules. M-Mmultiplebonding;preparation,structureandbondingindinuclear$[Re_2Cl_8]^{2-}$ ion,trinuclear$[Re_3Cl_9]$,tetra nuclear$W_4(OR)_{16}$,hexa nuclear$[Mo_6Cl_8]^{4+}$and$[Nb_6Cl_{12}]^{2-}$.

Unit-II: Organometallic chemistry of transition metals: Classification and electron countingrules, hapticity, synthesis, structure and bonding of Ferrocene, dibenzene chromium, cyclo heptatriene and tropylium complexes of transition metals.Reactions of organometallic compounds - oxidative addition reductive elimination, insertion andelimination.Applicationsoforganometalliccompounds - Catalytichydrogenation,Hydroformylation.

Unit-III: Reaction mechanism of transition metal complexes: Kinetics of octahedral substitution,acid hydrolysis, base hydrolysis-conjugate base (CB) mechanism. Direct and indirect evidences infavour of CB mechanism. Anation reactions. Reactions without metal-ligand bond cleavage. Factorsaffecting the substitution reactions in octahedral complexes. Trans effect on substitution reactions insquare planar complexes. Mechanism of redox reactions, outer sphere mechanism, cross reactionsandMarcus – Hushequation,innerspheremechanism.

Unit-IV:TermsymbolsandElectronicspectra:Termsymbols: Termsymbolsandtheirderivation Microstates, Hunds rules to predictground terms and ground states. List of groundenergy and higher energy terms from d^1 to d^9 configurations; **Electronic spectra of transitionmetalcomplexes**Spectroscopicterms.Selectionrules,Racahparameters,Termseparationenergiesford^{n}configurationsCorrelationdiagramsandOrgeldiagrams.Tanabe-Suganodiagramsford1 tod^{9}configurations.Calculationsof Dq,Bandβparameters.Chargetransferspectra.

Unit-V: Bio-inorganic chemistry and Magnetic properties of complexes: Storage and transportofdioxygenbyHemoglobinandMyoglobin,Chlorophyll,VitaminB_{12}anditsimportance.
Magneticpropertiesoftransitionmetalcomplexes: Orbital and spin contribution, spin-orbit coupling andmagneticmoments.Typesofmagnetism,factorsaffecting onParamagnetism, Dia, ferro and Anti magnetism.

Course Learning Outcome(S): After studying this paper, students will acquire the knowledge ofNon-metalcagesandmetalclusters,Organmetallicchemistryoftransitionmetals,Reactionmechanism of transition metal complexes, Term symbols and Electronic spectra and Bio-inorganicchemistryandMagneticpropertiesofcomplexes.

Textbooks/Referencebooks:

1. InorganicChemistrybyHuheey.Harper andRow.
2. Conciseinorganicchemistry byJ.D.Lee,ELBS.
3. Inorganicchemistry,K.F.PurcellandJ.C.Kotz,HoltSaundersinternational
4. OrganometallicchemistrybyR.C. MehrotraandA.Singh. NewAgeInternational.
5. AdvancedInorganicChemistrybyCottonandWilkinson,WileyEastern
6. InorganicreactionmechanismbyBasoloandPearson, WileyEastern
7. BioinorganicChemistrybyK.HussanReddy
8. BiologicalAspectsofinorganicchemistrybyA. W.Addiso,W. R.Cullen, D.DorphinandG. J.James.WelieyInterscience.
9. PhotochemistryofcoordinationcompoundsbyV.BalzaniandV.Carassiti.AcademicPress.
10. TextbookofCoordinationchemistrybyK.SomaSekharaRaoandK.N.K.Vani,KalyaniPublishers.

KRISHNA UNIVERSITY, MACHILIPATNAM - 521003DEPARTMENTOFCHEMISTRY

M.Sc.,CHEMISTRY(ORGANICCHEMISTRY)

IISEMESTER

PaperCode&Title:OCH204:RESEARCH METHODOLOGY& IPR

No.ofhoursperweek:04 **Totalcredits:04**

Totalmarks: 100(Internal:30M&External:70M)

Course Objectives:

- To understand some basic concepts of research and its methodologies
- To develop an understanding of the basic framework of research process.
- To develop an understanding of various research designs and techniques.
- To identify various sources of information for literature review and data collection.
- Ability to write a research Proposal, report and thesis
- To demonstrate knowledge and understanding of IPR Filing and Rights

UNIT- I: Foundations of Research & Research Design

Meaning of Research – Definitions of Research – Motivation in Research – General Characteristics of Research – Criteria of Good Research – Types of Research – Research Process – Research Methods vs. Methodology – Defining and Formulating the Research Problem – Review of Literature – Approaches to Critical Literature Review – Importance of Literature Review in Identifying Research Gaps and Defining a Problem – Development of Working Hypothesis.

UNIT- II:Research Design, Sampling Concepts, and Data Collection Methods

Meaning, Significance and Characteristics of Good Research Design–Types of Research Design: Exploratory, Conclusive Research and Experimental – Sampling Theory: Types of Sampling and Errors in Sampling – Data Collection: Types of Data – Data Collection Methods and Techniques for Primary and Secondary Data.

UNIT-III:Measurement & Scaling Techniques, Hypothesis Formulation and Testing, Overview of Data Analysis and Report Writing

Basic measurement scales –Reliability & Validity – Definition and Types of Hypothesis– Hypothesis Formulation and Testing Procedure – Overview of Data Analysis: Methods, Process and Types–Report Writing: Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report Precautions for Writing Research Reports – How to Write a Research Proposal– Research Ethics, Conflict of Interest and Plagiarism.

UNIT- IV: Intellectual Property Rights (IPR)

Definition and Nature and Features of Intellectual Property Rights (IPR) –Types of Intellectual Property Rights – Procedure for Grants of Patents –Rights of a Patent – Scope of a Patent Rights-Licensing and Transfer of Technology–Why protection of intellectual property is important? Enforcement of IPR – Infringement of IPR.

UNIT -V:Indian and International Scenario and New Developments in IPR

IPR Developments in India for the past Five Years – Development of IPR Laws in India – International Cooperation on IPR – New Developments in IPR – Administration of Patent System –International Patent protection – Case Studies in Indian and Global Contexts.

Course Learning Outcomes:

At the end of this course the students should be able to:

- Understand some basic concepts of research and its methodologies
- Identify appropriate research topics
- Select and define appropriate research problem and parameters
- Demonstrate the ability to choose methods appropriate to research aims and objectives
- Have adequate knowledge on measurement & scaling techniques
- Have basic awareness of data analysis-and hypothesis testing procedures

- Prepare a project proposal (to undertake a project)
- Write a research report and thesis
- File Patents, Trademarks and Copy Rights

Text and Reference Books:

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002, An introduction to Research Methodology, RBSA Publishers.
2. Cohen, L. Lawrence, M., & Morrison, K. (2005), Research Methods in Education (5th edition). Oxford: Oxford University Press.
3. Kothari, C.R., 1990, Research Methodology: Methods and Techniques, New Age International.
4. Dornyei, Z. (2007). Research Methods in Applied Linguistics. Oxford: Oxford University Press.
5. Anthony, M., Graziano, A.M. and Raulin, M.L., 2009, Research Methods: A Process of Inquiry, Allyn and Bacon.
6. Fink, A., 2009, Conducting Research Literature Reviews: From the Internet to Paper. Sage Publications.
7. Day, R.A., 1992, How to Write and Publish a Scientific Paper, Cambridge University Press.
8. Wadehra, B.L. 2000, Law relating to patents, trade marks, copyright designs and geographical indications. Universal Law Publishing.
9. Coley, S.M. and Scheinberg, C. A., 1990, Proposal Writing, Sage Publications.
10. Carlos, C.M., 2000. Intellectual property rights, the WTO and developing countries: the TRIPS agreement and policy options, Zed Books, New York.
11. Leedy, P.D. and Ormrod, J.E., 2004, Practical Research: Planning and Design, Prentice Hall.
12. Satarkar, S.V., 2000. Intellectual property rights and Copy right. EssEss Publications.

Important Websites:

- www.ipindia.nic.in - Intellectual Property Office, India
- www.patentoffice.nic.in – Patent office, India
- http://copyright.gov.in/ - Copyright Office, India
- ipr.icegate.gov.in – Automated Recordation & Targeting for IPR Protection
- http://www.icegate.gov.in- E- Commerce portal of Central Board of Excise and Customs
- www.ipab.tn.nic.in - Intellectual Property Appellate Board, India
- www.mit.gov.in – Department of Information Technology, India
- http://www.mit.gov.in/content/office-semiconductorintegrated-circuits-layout-designregistry
- Semiconductor Integrated Circuits Layout-Design Registry (SICLDR)
- www.plantauthority.gov.in – Plant Varieties and Farmers' Rights Authority, India
- http://nbaindia.org/ - National Biodiversity Authority
- www.nipo.in – The Indian IPR Foundation
- www.wipo.int – World Intellectual Property Organisation
- http://www.wto.org – World Trade Organisation

KRISHNA UNIVERSITY, MACHILIPATNAM - 521003

DEPARTMENTOFCHEMISTRY

M.Sc.,CHEMISTRY(ORGANICCHEMISTRY)

II SEMESTER

PAPERCODE&TITLE:OCH205: HETERO CYCLICCHEMISTRY

No.ofhoursperweek:04 **Totalcredits:04**

Totalmarks:100 **(Internal:30M& External:70M)**

Course Learning Objective(S): The main objective of this paper is to impart basic andupdatedknowledgeforthestudentsonHeterocyclicChemistry.

UNIT-I: Definition,Classification,andNomenclature(HantzschWidmanSystem)ofheterocycles. **Three membered Heterocyclic Compounds:** Synthesis, reactivity, and importance of thefollowingringsystems:Aziridines,Oxiranesand Thiiranes.

UNIT-II: Four membered Heterocyclic Compounds: Synthesis, reactivity, and importanceofthefollowingringsystems:Azitidines,oxetanes,Thietanes.

UNIT-III: Five membered Heterocyclic Compounds with two hetero atoms: Synthesis,reactivityn and importanceofthefollowingheterocycles:Pyrazole,Imidazole,Oxazole,Isoxazole,Thiazole, isothiazole.

UNIT-IV: Six-membered Heterocyclic Compounds with two hetero atoms: Synthesis,reactivity andimportance of the following heterocycles: Pyridazines,pyrimidine, Pyrazine,Oxazine,Thiazine.

UNIT-V:Fused heterocycles : Synthesis and reactivity of Indole, quinolione, isoqinoline, benimidazole, quinoxalines, isoxazoles

CourseLearningOutcome(S): Afterstudyingthispaper,studentswillacquiretheknowledgeon synthesis and reactivity of Heterocyclicmolecules.

Referencebooks:

1. SomeModemMethodsofOrganicSynthesisW.Caruthers,CambridgeUniversityPress,Cambridge.
2. OrganicSynthesisvizBoranes,HerbetC.BrownGray,W.KramerAlanB.LevyandM.MarkMidlandJohnWilly&Sons,NewYork.
3. Heterochemistry,T.L.Gilchrist,Longmanscienceandtech.
4. AnintroductiontotheChemistryofHeterocyclicCompounds,R.M.Acheson,IntersciencePublishers,NewYork
5. PrincipleofOrganicChemistry,RocNorman,J.M.Coxon,NelsonThroms
6. AdvancedOrganicChemistry,F.ACarey andR.J.Sundberg.Plenum.
7. HeterocyclicchemistrybyJaiJackLie,Springerpublications.

KRISHNA UNIVERSITY, MACHILIPATNAM - 521003DEPARTMENTOFCHEMISTRY
M.Sc.,CHEMISTRY(ORGANICCHEMISTRY)
IISEMESTER

PAPER CODE & TITLE: OCH 206 :CHEMISTRYOFBIO-ORGANICCOMPOUNDS

No.ofhoursperweek:04 **Totalcredits:04**

Totalmarks:100 **(Internal:30M& External:70M)**

CourseLearningObjective(S): Themainobjectiveofthispaperistogiveabasicandupdatedknowledgeforthestudentson Bio-OrganicChemistry**.**

UNIT-I: Carbohydrates: Introduction, Classification, Occurrence of Hexoses and Ketoses,Nomenclature, Mutarotation, anomeric effects and Stereochemistry and ring structures ofCarbohydrates.ChemistryofGlucose,Fructose,andSucrose.

UNIT-II:AminoAcidsandProteins: ClassificationofAminoacidandtheirgeneralproperties. General methods of synthesis of alpha-amino acids. Isoelectric point, Determinationof C-Terminal andN-terminalAminoacid. Definition and Classificationof PeptidesandProteins.

UNIT-III:Vitamins: Classification,Occurrence,Structuralelucidation,synthesisandbiogenesisofVitamin-A1,B1,C,D and B12 and its importance.

UNIT-IV:Nucleicacids: BasicconceptsoftheStructureofRNA,DNA,andtheirhydrolysis products.Base pairs and whatson and crick model, Nucleotides, Nucleosides, reactions of nucleic acid bases, mutations, andHeterocyclicbases.

UNIT-V: Bio polymers:Introduction,Classificationof bio-polymers,properties of biopolymers, Difference between bio polymers and synthetic polymers,production and processing of biopolymers. Applications of bio-polymers.

CourseLearningObjective(S): This paper imparts updated knowledge on bioorganic molecules and their role in advancement of science which is very important to investigate in biological chemistry.

ReferenceBooks:

1. Naturalproducts:ChemistryandBiologicalsignificance,J.Mann,R.S.Davidson,J.B.Hobbs,D.V.BanthropdeandJ.B.Harborne.
2. OrganicChemistry,vol-2,I.L.Finar.
3. Stereoselectivesynthesis:apracticalApproach,M.Nogrudi.
4. Rodd's Chemistryofcarboncompounds,Ed.S.Coffey.
5. Chemistry,BiologicalandPharmacologicalPropertiesofMedicinalPlantsfromtheAmericans ByEd.Kurt.Hostettmann,M.P.GuptaandA.Marston.
6. IntroductiontoFlavonoidsby B.A.Bohm.
7. Necotrends innaturalproducts ChemistrybyAta-ur-RahmanandM.I.Choudhary.
8. Chemistryofnaturalproducts byS.V.Bhat,B.A.NagaSampagiandM.SivaKumar.
9. Biopoymers: Biomedical and Environmental applications by Susheelkalia Scrivener, Willey publication.

KRISHNA UNIVERSITY, MACHILIPATNAM - 521003DEPARTMENTOFCHEMISTRY
M.Sc.,CHEMISTRY(ORGANICCHEMISTRY)
II SEMESTER

PAPER CODE & TITLE: OCH 207 ‐POLYMERSCHEMISTRY

No.ofhoursperweek:04 **Totalcredits:04**

Totalmarks:100 **(Internal:30M& External:70M)**

Course Learning Objective(S): The main objective of this paper is to give a basic andupdatedknowledgeforthestudentsonPolymerchemistry.

UNIT – I: Polymers introduction: Introduction, Classification of polymers, Polymerization, chain polymerization,condensation polymerization, steppolymerization,Copolymerization,Freeradicalchainpolymerization,cationicpolymerization ,anionicpolymerization,PolymerizationTechniques,GraftandBlockCopolymers.

UNIT–II: PolymerSynthesis : PolymerSynthesis,IsolationandPurificationofpolymers,PolymerFractionation,Molecularweig htdetermination,Molecularweightdeterminationcurve,ProcessingTechniques.

UNIT–III:Polymer reactivity: PolymerReactions– Introduction,Hydrolysis,Acidolysis,Aminolysis,Hydrogenation, AdditionandSubstitutionReactions, Cyclisationreactions, Cross-linkingReactions.

UNIT – IV: Degradation of polymers: Polymer Degradation – Definition, Types of Degradation, Thermal Degradation,Mechanical Degradation, Degradation by Ultrasonic Waves, Photodegradation, DegradationbyHigh-EnergyRadiation,OxidativeDegradation,HydrolyticDegradation.

UNIT–V:Applications of Polymers: Plastics,Fibres,Elastomers-Polyethylene,Polystyrene,PolyEsters,PolyAcrylonitrile,Polyurethanes,PolyvinylChloride,Poly isoprenes.Resins–PhenolFormaldehydeResin,UreaFormaldehydeandMelamine– FormaldehydeResins,EpoxyPolymers,SiliconPolymers, poly Carbonates and poly urethanes .

CourseLearningOutcome(S): Afterstudyingthispaper,studentswillacquiretheknowledgeofPol ymerchemistry.

Referencebooks:

1. TextbookofPolymerSciencebyFrod,W.Billmayer,
2. An IntroductiontoPolymerChemistrybyMoore.
3. PolymerChemistry-AnIntroductionbyM.P.Stevens.
4. PolymerScience –VRGowariker,NVViswanathan,JayadevSreedhar.

KRISHNA UNIVERSITY, MACHILIPATNAM -

521003DEPARTMENTOFCHEMISTRY

M.Sc.,CHEMISTRY(ORGANICCHEMISTRY)

II SEMESTER

PAPER CODE & TITLE: OCH 208 Organic Chemistry Lab-2

Totalmarks:100 (Internal:30M& External:70M)

Course Objectives:

- To develop an insight into the identification of organic compounds by systematic analysis
- To understand the process of identification of organic compounds by systematic analysis
- To acquire skills in the identification of organic compounds by systematic analysis

COURSE CONTENT:

1. Preparation of organic compounds: Two stage preparations by reactions involving nitration,halogenation,oxidation,reduction,alkylation,acylation,condensationandrearrangement.(A studentis expected toprepare at least5 differentorganic compounds by making use ofthe reactionsgivenabove).

2. Identification of the unknown organic compounds

Systematic identification of organic compounds – preliminary tests, detection of extra elements, solubility, common functional group tests (determination of functional group/s in a single compound, if present), preparation of two rational derivatives

The given organic compound must be identified by comparing the melting point /Boiling point of the compound and melting points of its derivatives with the literature

List of suggested compounds

Glucose, fructose, benzaldehyde, p-anisaldehyde, p-chloro benzaldehyde, acetophenone, phenol, cresols, naphthols, esters, p-chloro benzoic acid, aniline, p-tolune, p-anisidine, p-chloroaniline, diphenyl amine, N,N-dimethylaniline, benzamide, naphthalene and anthracene.

Learning Outcomes:

At the end of the course, the learners should be able to:

Identify an organic compound by systematic analysis

Develop skill in identification of organic compounds by systematic analysis

Apply the skill in the identification of new organic compounds by systematic analysis

TEXT BOOKS

1. A Textbook of Practical Organic Chemistry by A. I. Vogel, ELBS and Longman group.
2. Practical Organic Chemistry by Mann and Saunders, ELBS and Longman group.
3. A.I.Vogel,"ElementaryPracticalOrganicChemistry", Longman
4. ReactionandSynthesis inOrganicLaboratory,B.S.Furniss,A.J.Hannaford,Tatchell,UniversityScienceBooksMillsvalley.
5. PurificationofLaboratorychemicals,manual,W.L.F.ArmaregoEDDPerrin.
6. ReactionandSynthesis inOrganicChemistryLaboratory, Lutz-Friedjan-Tietze,TheophilEicher,UniversityScienceBook.

KRISHNA UNIVERSITY, MACHILIPATNAM - 521003DEPARTMENTOFCHEMISTRY

M.Sc., CHEMISTRY (ORGANIC CHEMISTRY)

IISEMESTER

PaperCode& Title:OCH209: PHYSICALCHEMISTRY LAB

Totalmarks: 100(Internal:30M&External:70M)

Course Objectives:

To teach laboratory ethics, safety and cleanliness, Preparation and standardization of solutions, develop hands-on experience/practical knowledge in performing Physical chemistry experiments, develop skills on handling instruments like conductometry and perform different types of acid- base titrations, train plot accurate graphs of the desired scale for the calculations of Langmuir and Freundlich isotherms, train to Prepare the solution of the desired concentration and the desired volume in Cuprammonium cation.Over allobjectiveofthispaperistogiveapracticalknowledgeforthestudentson Physicalchemistryexperiments.

1. Conductometry

a) Conductometric titration of strong acid (HCl) vs strong base (NaOH)

b) Conductometric titration of weak acid (CH_3COOH) vs strong base (NaOH)

c) Conductometric titration of mixture of acids (HCl + CH_3COOH) vs strongbase (NaOH)

2. Determination of Critical solution temperature of phenol-Water system
3. Potentiometric titration of Iron (II) using potassium dichromate
4. Determination of kinetics of Ester hydrolysis
5. Determination of Equilibrium constant of Potassium Iodide-Iodine system
6. Determination of effect of electrolyte (NaCl) on the miscibility temperature of Phenol-Water system.
7. pH-metricdeterminationofstrongacidwithstrongbase.
8. Relative strengthsofacidsbystudyingthehydrolysisofethylacetate /methylacetate.

DeterminationofequilibriumconstantofKI$_3$KI +I$_2$bypartitioncoefficient.

9. Determinationofunknownconcentrationofpotassiumiodidebypartitioncoefficientmethod.
10. DistributioncoefficientofBenzoicacidbetweenBenzeneandwater.
11. Determinationofcriticalsolutiontemperatureofphenol-watersystem.

Course Outcomes:

At the end of the course, the learners should be able to: develop/practical skills to solve problems in chemistry, extend the principle of Conductometric titration to other kind of reactions, learn to use the concept of phase diagram for different systems, apply adsorption isotherms for other reactions.

Textbooks/Referencebooks:

1. ExperimentalPhysicalchemistrybyV.D.Athawale,ParulMathur,NewAgeInternationalpublishers.
2. PhysicalchemistryexperimentsbyV.P.Kudesia,PragatiPrakasanpublishers.
3. AdvancedpracticalPhysicalchemistrybyJ.B.Yadav,Krishna'seducationalpublishers

KRISHNA UNIVERSITY, MACHILIPATNAM – 521003DEPARTMENTOFCHEMISTRY
M.Sc.,CHEMISTRY(ORGANICCHEMISTRY)
IIISEMESTER

PAPERCODE &TITLE: OCH301:ORGANICREACTIONS& MECHANISMS

No.ofhoursperweek:04 **Totalcredits:04**

Totalmarks:100 **(Internal:30M& External:70M)**

Course Learning Objective(S): The main objective of this paper is to give a basic andupdated knowledge for the students on Oxidations, Reductions, Molecular Rearrangements,PericyclicReactionsandOrganicPhotoChemistry.

UNIT – I: Named Reactions :

Henry reaction, Nef reaction, Kulinkovich reaction, Ritter reaction, Sakurai reaction, Tishchenko reaction and Ugi reaction. Brook rearrangement; Tebbe olefination.MetalmediatedC-CandC-Xcouplingreactions:Heck,Stille,Suzuki,Negishi and Sonogashira, Nozaki-Hiyama, Buchwald-Hartwig, Ullmann coupling reaction.

UNIT-II: Multi component Reactions:

Passerini reaction,Biginelli reaction,Hantzsch reactionand Mannich reaction. Metathesis: Grubb's1stgenerationand2ndgenerationcatalyst and mechanisms, OlefinCrosscouplingMetathesis (OCM),RingClosingMetathesis(RCM),RingOpeningMetathesis(ROM)and applications.

Unit-III: Oxidations: Definition and types of oxidations, preparation andsynthetic applicationsofDDQ,SeO_2,NBS,Ruthenium tetroxide, Tl(III) nitrate, Chromium (VI) oxidants, MnO_2,Ag_2CO_3,$Pb(OAc)_4$,$KMnO_4$, OsO_4, HIO_4,Prevostdi-hydroxylationandWood-wardsmodifieddi-hydroxylation.Definitionofepoxidationand epoxidationsbyPer-acids· phenols (Fremy's salt, silver carbonate), alkenes to epoxides (peroxides/per acids based), Sharpless asymmetric epoxidation, Jacobsen epoxidation, Shi epoxidation, alkenes to diols (Manganese, Osmium based), Sharpless asymmetric dihydroxylation,alkenes to carbonyls with bond cleavage (Manganese, Osmium, Ruthenium and lead based, ozonolysis), alkenes to alcohols/carbonyls without bond cleavage (hydroboration-oxidation, Wacker oxidation, selenium, chromium basedallylic oxidation) ketones to ester/lactones (Baeyer-Villiger).

UNIT-IV:Reduction

Reduction:Definition and types of reductions, preparation and synthetic applications Catalytichydrogenation (Heterogeneous: Palladium/Platinum/ Rhodium/Nickel etc; Homogeneous: Wilkinson), Transfer hydrogenation,Noyori asymmetric hydrogenation. Metal based reductions using Li/Na/Ca in liquid ammonia, Sodium, Magnesium, Zinc, Titanium and Samarium (Birch, Pinacol formation, McMurry, Acyloin formation, dehalgenation and deoxygenations), Hydridetransferreagents-NaBH4triacetoxyborohydride,LiAlH4, DIBAL-H, $NaCNBH_3$,trialkylborohydrides,Reductionwithdi-imide and Red-Al.

Unit V MolecularRearrangements: Definitionandclassificationofmolecularrearrangements; mechanism, migratoryaptitude, stereochemistry and syntheticapplications of Pinacol-pinacolone, Wagner-Meerwein, Tiffeneau – Demjanov, Claisen rearrangement, Arndt-Eistertsynthesis, Beckmann, Hofmann, Curtius, Schmidt, Lossen;Baeyer-villiger, Hydro peroxide, Dakin, Stevens, Neber, Benzil-Benzilic acid, Fischer-Hepp, Orton,Bamberger,ReformatskyandFavorskiirearrangements.

CourseLearningOutcome(S): Afterstudyingthispaper,studentswillacquiretheknowledge on

Oxidations, Reductions, Molecular Rearrangements.

Textbooks:

1. Some Modern Methods of Organic Synthesis W. Carothers, Third Edition, Cambridge University Press, Cambridge, 1988.
2. F. A. Caryand R. I. Sundberg, Advanced Organic Chemistry, Part A and B, 5th Edition, Springer, 2009.
3. M.B.Smith,OrganicSynthesis,2ndEdition,2005
4. J. Tsuji, Palladium Reagents and Catalysts, New Perspectives for the 21st Century, JohnWiley & Sons, 2003.
5. I. Ojima, Catalytic Asymmetric Synthesis, 2nd edition, Wiley−VCH, New York, 2000.
6. J. Clayden, N. Greeves, S. Warren and P. Wothers, Organic Chemistry, Oxford University Press, 2001.
7. R.Noyori,AsymmetricCatalysisinOrganicSynthesis,JohnWiley&Sons,1994.
8. L. Kuerti and B. Czako, Strategic Applications of named Reactions in Organic Synthesis Elsevier Academic Press, 2005.
9. OrganicSynthesis:Specialtechniques.V.K.AhulwaliaandRenuAgarwal
10. Organic Chemistry,Paula YurkanisBruice,4thEd.(PrinticeHall)
11. AdvancedOrganicChemistry-Reactions,Mechanism andstructure,JerryMarch,6th Ed.
12. OrganicChemistry,R.T.MorrisonandR.N.Boyd(Prentice-Hall)
13. ModernOrganicSynthesisAnIntroduction,GeorgeS.ZweifeMichaelHeNantzUniversityofCalifornia.

KRISHNA UNIVERSITY, MACHILIPATNAM - 521003DEPARTMENTOFCHEMISTRY
M.Sc.,CHEMISTRY(ORGANICCHEMISTRY)
IIISEMESTER

PAPERCODE&TITLE:OCH302:MODERNORGANICSYNTHESIS

No.ofhoursperweek:04 **Totalcredits:04**

Totalmarks:100 **(Internal:30M& External:70M)**

Course Learning Objective(S): The main objective of this paper is to give a basic andupdated knowledge for the students on Formation of C-C single& double bonds, Diels–Aiderandrelatedreactions,RetroSyntheticAnalysis andProtectingGroups.

Unit-I:FormationofC-Csinglebonds: Alkylationofrelativelyacidicmethylenegroups, ketones, enolate and enamines,umpolung (dipole inversion), the aldol reaction, Allylic alkylation of alkenes, alkylation of α-thiocarbonions- α-selenocarbonions, theadditionof freeradicalstoalkenes andsyntheticapplicationsofcarbenesandcarbenoids.

Unit-II: Formation ofC-C double bonds: Elimination reactions, sulphoxide-sulphonaterearrangement,Pyrolytic *syn*eliminations, alkenes form hydrazones, 1,2-diols, the Wittig and modified wittig reactions, synthesis ofallyl alcohols,alkenes fromsulphones,decarboxylation of β-lactones.Stereoselectivesynthesisoftriandtetrasubstitutedalkenes,fragmentationreactions,oxidativedecarboxylationofcarboxylicacids,stereospecificsynthesisfrom1,2-diols,reductivedimerizationofcarbonylcompounds.

UNIT-III: Reactions of unactivated carbon-hydrogen bonds

Unactivated carbon-hydrogen bonds: Definition, mechanism and synthetic applications-The Hoffmann-Loeffler-Freytagreaction(HLFreaction)-cyclisationreactionsofNitrenes-theBartonreaction-Photolysisoforganichypohalites,hypochlorites,hypobromitesand hypoiodites.

UNIT-IV:AsymmetricSynthesis

Chirality and prochirality and specific rotation, racemization and resolution of racemic mixture, Topocity –Diastereoselectivity and enantioselectivity – Use of chiral auxiliaries, Chiral enolates and chiral reagents, alkylation of chiralimines–Asymmetricoxidation–Sharplessepoxidation – Asymmetric reduction – borate reagents.Organocatalysis using proline.

UNIT V:Modern synthetic methods: Fujiwara MoritaniReaction , Heck reaction and its applications to synthesis of bioactive molecules, Baylis Hillman reaction, CH-functionalization via C-H bond activation, asymmetric C-H functionalization via C-H activation.

CourseLearningOutcome(S): Afterstudyingthispaper,studentswillacquiretheknowledge of Formation of C-C single & double bonds, Diels–Aider and related reactions,RetroSyntheticAnalysisandProtectingGroups.

Referencebooks:

1. Modernmethods ofOrganicsynthesis,W.Carruthers CambridgePress.
2. ModernSyntheticReactions,HerbertO.House,SecondEdition,W.A.Benzamine Inc. Menio Park, California, 1972.
3. Modern Method of Organic Synthesis, Carruthers and ColdhamSachinkumar Ghosh,CambridgeNewCentralBookAgency.
4. PrincipleofOrganicSynthesis-R.O.C.NormanandJ.M.Coxon.(ELBS)
5. AdvancedorganicchemistrypartA&B;Fourthedition;FrancisACaryandRichardJ.Sundberg;KluwerAcademic/PlenumPublisherNewYork,2000.
6. Advancesin OrganicReaction mechanismand structure,J.March,McGrewHill.
7. Organic chemistry Jonathan Clayden, Nick Geeves, Stuart Warren, 2nd Edition, 2012, Oxford University Press.

8. PrinciplesinAsymmetricsynthesisbyRobertE.Gawley&JEFFREYAUBE.

KRISHNA UNIVERSITY, MACHILIPATNAM - 521003DEPARTMENTOFCHEMISTRY
M.Sc.,CHEMISTRY(ORGANICCHEMISTRY)
IIISEMESTER
PAPERCODE &TITLE:OCH303 :ORGANOMETALLICCHEMISTRY

No.ofhoursperweek:04 **Totalcredits:04**
Totalmarks:100 **(Internal:30M& External:70M)**

CourseLearningObjective(S): Themainobjectiveofthispaperistogiveabasicandupdatedknowledgeforthestudentsonsynthesis and applications of Organometallic Reagents.

UNIT-I:Oragano metallic compounds : Introduction and classification, denticitiy , heptacity, metal carbonyls, metal π-systems, isolable concept, 18 electron rule, Cp complexes.

Unit II: Organo Magnesium and Lithium compounds: Classification of organometallic compounds, Preparation of Grignard reagentswith alkyl, allyl, and propargyl halides, alkylation reaction with carbonyl compounds, esters,alcohols,amines,acids,carbondioxide,carbondisulfide,sulfurdioxide.Preparationofalkyllithium reagents, Lithium Di isopropyl amide (LDA) and its synthetic applications.

Unit-III: Organo Copper, Nickel and platinum compounds: Organo copper reagents, organocuprates,lithiumorganocuprates(Gilmanreagents).Organonickelcompounds:π-allylnickelcomplexes,preparationof1,5cyclicdienes,nickelcarbonyl.Preparationoforganoplatinumcompoundsandmedicinalapplications oforganoplatinumcomplexes.

Unit-IV: Organoboranes: Preparation of Organobornaes viz hydroboration with BH_3-THF,dicylohexylboranes,disiamylborane,thexylborane,9-BBN,andmono-, di-isopinocamphenylborane,catacolboranes,protonolysis, oxidation, isomerization, cyclization, rearrangements. Free radical reactions oforganoboranes,reactionswithα-bromoketones,α-bromoesters,.Functional group transformations of Organo boranes- carbonylation, cyanoboration.

UNIT–V:Organosilanes: Preparationandsyntheticapplicationsoftrimethylsilylchloride,dimethyl-t-butylsilyl chloride, trimethylsilylcyanide, trimethylsilyliodide and trimethylsilyltriflate. Protection of functional groups - Trimethylsilylethers, Silylenolethers Peterson's olefination..Synthetic applications of. α-silylcarbanionandβ-silylcarbonylcompounds,alkenylsilanes,Allylsilanes,Theβ-effect,controlofrearrangementofcarboniumions bysilicon.

CourseLearningOutcome(S): AfterstudyingthispaperstudentswillacquiretheknowledgeofOrganometallic Reagents and their utilization.

Referencebooks:

1. OrganometallicinSynthesisAManualby MSchlosser,L.Hegedus,B.Lipshutzetal,JohnWily&sons.
2. ModernmethodsoforganicsynthesisbyW.Carruthers(Cambridge).
3. OrganicsynthesisbyH.O.House.
4. Organometallics:Aconciseintroduction,ChristophElschenbroich,3rdedition,Willey-VCH.
5. Advanced OrganicChemistry,F.ACareyand R.J.Sundberg.Plenum.
6. Transitionmetalsinthesynthesisofcomplexorganic molecules,Hegedus,L.S,secondedition,UniversityScience,Book,CA,1999.
7. OrganometallicChemistry and Catalysis,Astruc,D,SpringerVerlag,2007.

8. Organotransitionmetal chemistry: Applicationstoorganicsynthesis, Davies,S.G,PergamonPress,NewYork,1986.
9. Transition metal organo metallics by Hartwig.

KRISHNA UNIVERSITY, MACHILIPATNAM – 521003

DEPARTMENTOFCHEMISTRY

M.Sc.,CHEMISTRY(ORGANICCHEMISTRY)

IIISEMESTER

PAPERCODE&TITLE:OCH304:CHEMISTRYOFNATURALPRODUCTS

No.ofhoursperweek:04 **Totalcredits:04**
Totalmarks:100 **(Internal:30M& External:70M)**

Course LearningObjective(S): The main objective of this paper is to give a basic andupdatedknowledgeforthestudentsonAlkaloids,Terpenoids,Steroids,Flavonoids,Isoflavonoid sandPlantpigments.

Unit-I: Alkaloids: Introduction, Definition, nomenclature, classification, isolation, synthesis and general methodsfor structural elucidation of alkaloids. Structureelucidationof Morphine,Vincristine,QuinineandReserpine.

Unit-II: Terpenoids: Introduction, Definition, nomenclature, classification, isolation and synthesis of terpenoids. isoprene rule andspecial isoprene rule general methods for structural elucidation of Terpenoids. Structureelucidation and synthesis of farnesol, Zingiberene,Santoninandβ-amyrin.

Unit-III:Steroids: Introduction,Definition,nomenclature,classification. Occurrence, isolation, physiological action synthesis and structureelucidationof Cholesterol,Androsterone, Testosteroneand Progesterone.

Unit-IV:FlavonoidsandIsoflavonoids: Introduction,Definition,nomenclature,classification, Occurrence,isolation,physiologicalaction, synthesis, biosynthesis andstructuralelucidationofKaempferol andQuercetin.

Unit-V: Plant pigments: Introduction, Definition, nomenclature, classification and generalmethods forstructuralelucidationofPlantpigments.synthesisofquinones-Polyporic acid. Chlorophyll and haemin.

CourseLearningOutcome(S): Afterstudyingthispaper,studentswillacquiretheknowledgeofAlka loids,Terpenoids,Steroids,Flavonoids,IsoflavonoidsandPlantpigments.

Textbooks/Referencebooks:

1. Chemistry ofNaturalProducts,K.W.Bentley
2. ChemistryofNaturalproductsby P.S.KalsiKalyaniPublishers.1983
3. Chemistryandphysiologyof alkaloidsbyManskeVol.I&II,VII
4. OrganicChemistry,Volume2,Stereochemistryandchemistryofnaturalproducts,I.L.Finar,5thEdition.ELBS.
5. ChemicalAspectsofBiosynthesis,JohnMann,OxfordUniversityPress,Oxford,1996.
6. ChemistryofNaturalProducts.AUnifiedApproach,N.R.Krishnaswamy,University Press (India) Ltd., Orient

Longman Limited, Hyderabad, 1999.

7. Chemistry ofNaturalProducts,S.V.Bhat,Narosa PublishingHouse, 6th reprint 2010.

KRISHNA UNIVERSITY, MACHILIPATNAM-521003

Department of Chemistry

M.Sc., ORGANIC CHEMISTRY III SEMESTER

(Effective for the students admitted from the year 2022-23)

OCH305: Organic Photo ChemistryandPericyclic Reactions

No. of hours per week: 04 Total credits: 04

Total marks: 100 (Internal: 30 M & External: 70 M)

Course Learning Objective(S): The main objective of this paper is to give a knowledge for students on Photo Chemistry and Pericyclic reactions.

UNIT –I :**Principles of photochemistry**: quantum yield, electronic states and transitions, selectionrules,modes of dissipation of energy (Jablonski diagram), electronic energy transfer: photosensitization and quenching process.Photochemistry of (π, π∗) transitions: Excited state of alkenes, cis-trans isomerisation,photochemistry state, electrocyclisation and Sigmatropic rearrangements, di π-methanerearrangement.Intermolecular reactions: photocycloadditions, photodimerasation. Photoaddition reactions.Excited states of aromatic compounds, photodimerisation of benzene, photosubstitution reactionsof aromatic compounds and Photo-Fries rearrangement.

UNIT II:Photochemistry of (n, π∗) transitions: Excited state of carbonyl compounds, Norrish-I,andNorrish-II. photo reductions, photo oxidation and dimerisation,Paterno – Buchi reactions, photochemistry of an α, β-unsaturated ketones, cis-trans isomerisation. Photochemical rearrangement: di-pi methane rearrangement, 1,3,5-trimethylbenzene to 1,2,4-trimethylbenzene, Barton reactions.

UNIT - III Features and classification of pericyclic reactions: Phases, nodes and symmetry propertiesofmolecular orbital in ethylene, 1,3-butadiene, 1,3,5-hexatriene. Allyl cation, allyl radical,pentadienyl cation and pentadienyl radical. Thermal and photochemical reactions. Electrocyclic reactions: Woodward-Hoffmann selection rules for electrocyclic reactions. Explanation for the mechanism of electrocyclic reactions by: Symmetry properties of HOMOof open chain partner; Conservation of orbital symmetry and orbital symmetry correlationdiagram and Huckel-Mobius aromatic and antiaromatic transition state method.

UNIT - IV :CycloadditionReactions: Diels-Alder reaction. Woodward-Hoffmann selection rules forcycloaddition reactions. Mechanism of cycloaddition reactions by Conservation of orbital symmetry and orbital symmetry correlation diagrams Fukui FrontierMolecular Orbital (FMO) theory and Huckel-Mobius aromatic and antiaromatic transitionstate method. Endo-exo selectivity in Diels-Alder reaction and it's explanation by FMO theory.Examples of cycloaddition reactions.

UNIT - V :SigmatropicReactions: supra and antara facial modes, Selection rules for [i,j] shifts. Cope, degenerate Cope and Claisenrearrangements. Explanation of sigmatropic reactions by (i) symmetry properties of HOMO (ii)Huckel-Mobius aromatic and antiaromatic transition state method. Woodward-Hoffmann selection rules forcycloaddition reactions.Introduction to chelotropicreactions and the explanation of mechanism by FMO theory.

Course Learning Outcome(S): After studying this paper, students will acquire the knowledge of Photo Chemistry and Pericyclic reactions.

References:

1.Advanced Organic Chemistry Part A & Part B: F. A. Carey & R. J. Sundberg
2. Advanced Organic Chemistry: Jerry March
3. Organic Chemistry: Clayden, Greeves, Warren &wother.
4. Organic Chemistry: Stanley H. Pine
5. Organic Synthesis: W. Carruthers
6. Organic Synthesis: Norman and Coxon.

7. Photochemistry and Pericyclic reactions-Jayasingh and JagadambaSingh,New Age
8.Organic Photochemistry and Pericyclic reactions-M.G.Arora, Anmol publications.

KRISHNA UNIVERSITY, MACHILIPATNAM-521003

Department of Chemistry

M.Sc., ORGANIC CHEMISTRY III SEMESTER

OCH 306 Retrosynthetic analysis

Course objectives: This course is designed to impart knowledge on retrosynthetic analysis and will be useful for the designing of organic synthesis by using disconnection approach.

UNIT-I- Disconnection Approach – Principles : Introduction, Terminology: Retrosynthesis, Target Molecule (TM), synthon, synthetic equivalent,functional group interconversion (FGI). Linear and convergent synthesis. Criteria for selectionoftarget.OrderofeventsinretrosynthesiswithreferencetoSalbutamol,Proparcaine andDopamine.Chemoselectivity,Regioselectivity,reversalofpolarityandcyclizations.

UNIT-II C-X disconnections:
one group C-X disconnections (Carbonylderivatives,ethers,sulphidesandalcohols), Two group C-X disconnections (1,1-difunctionalised, 1,2- difunctionalised and 1,3-difunctionalisedcompounds), Control in carbonyl condensations, selective organic transformations: chemoselectivity,regioselectivity, stereoselectivity, enentioselectivity, cyclization reactions,amine synthesis.

UNIT-III*C-C Disconnections* **One group C-C Disconnections:**Alcohols and carbonyl compounds (1,1-C-C, 1,2-C-Cand 1,3-C-C), Alkene synthesis,use of acetylenes and aliphatic nitro compounds in organic synthesis. **Two group C-C Disconnections:**Diels-Alder reactions, 1,3 difunctionalized compounds and α, β-unsaturated compounds, controlin carbonyl condensations, 1,5 difunctionalized compounds, Michael addition.

UNIT-IV Protecting Groups :
Protection and deprotection of hydroxyl, carbonyls, amines, carboxylicacids, alkenes and alkynes

UNIT-V Ring Synthesis
Introduction to ring synthesis, saturated heterocycles, synthesis of three, four, five and six membered rings and their fused anologs, Robinsonannelation.

Course outcome: Students opting this course will have through knowledge on retrosynthesis and designing organic synthesis making use of retrosynthetic analysis.

Reference Books:

1. Organicsynthesesviaboranes/HerbertC.Brown;withtechniquesbyGaryW. Kramer,
2. AlanB.Levy,M.MarkMidland.NewYork:Wiley,1975
3. Some Modern Methods of Organic Synthesis W. Carothers, Third Edition, Cambridge University Press, Cambridge, 1988.
4. Organic Synthesis: The disconnection approach, S. Warrant John Wiley & sons, NewYork, 1984.
5. ModernSyntheticReactions,HerbertO.House,SecondEdition,W.A.Benzamine Inc. Menio Park, California, 1972.
6. PrincipleofOrganicSynthesis-R.O.C.NormanandJ.M.Coxon.(ELBS)
7. OrganicSynthesis:Specialtechniques.V.K.AhulwaliaandRenuAggarwal.
8. OrganicSynthesisbyCWillisandMWillis
9. Problemsonorganicsynthesisby StuartWarren

KRISHNA UNIVERSITY, MACHILIPATNAM - 521003DEPARTMENTOFCHEMISTRY

M.Sc.,CHEMISTRY(ORGANICCHEMISTRY)

III SEMESTER

PAPER CODE & TITLE: OCH 307Biological Chemistry

No.ofhoursperweek:04 **Totalcredits:04**

Totalmarks:100 **(Internal:30M& External:70M)**

Course Objective: This course is to impart knowledge on basic concepts of biological chemistry and the relation of biology and chemistry , biomolecules,cell structure and function , nucleotides and nucleic acids, transcription and translation and enzymes and catalysis.

Unit I Introduction of Biomolecules: Examples of biomolecules and building blocks of biopolymers. Types of reactions occurring in cells, structure of ice and liquid water, hydrogen bonding and hydrophobic interactions, buffers and the Henderson-Hasselbalch equation.

Unit II :Cell Structure and Function: Structure of prokaryotic and eukaryotic cells, intracellular organelles and their function, comparison of plant and animal cells.

Unit III Nucleotides and Nucleic acids: Ribonucleotides and Deoxyribonucleotides, RNA and DNA. Base pairing, Double helical structure of DNA and forces stabilizing nucleic acid structure. Methods used in nucleic acid separation and characterization, nucleic acid sequencing.

Unit IV Transcription and translation: Messenger RNA, RNA polymerase and protein synthesis. Control of transcription and protein-DNA interactions. The genetic code.tRNA structure and condon-anticodon interactions.Ribosomes and their structure.Gene cloning and site-directed mutagenesis.

Unit V:Enzymes and Catalysis: Substrate specificity of enzymes, requirement of coenzymes, regulation of enzyme activity and allosteric effect nomenclature, enzyme kinetics and the Michaelis-Menten equation, various types of enzyme inhibitions. application of enzymes in chemical synthesis, enzyme models and their applications.

Course outcome: Students optingthis course will have through knowledge on basic concepts of biological chemistry and the relation of biology and chemistry , biomolecules, cell structure and function , nucleotides and nucleic acids, transcription and translation and enzymes and catalysis

Suggested reading:

1. Biochemistry by *D. Voet & J. G. Voet*, 4th Edition (2010) John Wiley
2. Lehninger Principles of Biochemistry by *D. L Nelson & M. M. Cox*, 5th Edition (2008) W. H. Freeman and CBS Publishers, New Delhi
3. Biochemistry by *J. M. Berg, J. L. Tymoczko & L. Stryer*, 5th Edition (2002) W. H. Freeman

KRISHNA UNIVERSITY, MACHILIPATNAM - 521003DEPARTMENTOFCHEMISTRY

M.Sc.,CHEMISTRY(ORGANICCHEMISTRY)

IIISEMESTER

PAPERCODE &TITLE:OCH308:ORGANICCHEMISTRY LAB-3

No.ofhoursperweek:06 **Totalcredits:03**

Totalmarks:100 **(Internal:30M& External:70M)**

CourseLearningObjective(S): Themainobjectiveofthispaperistogiveabasicandupdatedknowledgeforthestudentsonorganicchemistrypractical.

1. **Preparation of organic compounds:** Three-stage preparations by reactions involvingnitration, halogenation, oxidation, reduction, alkylation, acylation, condensation, andrearrangement.(Astudentisexpectedtoprepareatleastfivedifferentorganiccompounds bymakinguseofthereactions givenabove).
2. SeparationofBinarymixturesofCarboxylicacid+Neutralorganiccompounds(Solventextractionmethod).
3. Separation ofBinarymixturesofBasicnature+Neutralorganiccompounds(Solventextractionmethod).
4. SeparationofBinarymixturesofPhenoliccompounds+Neutralorganiccompounds(Solventextractionmethod).

CourseLearningOutcome(S): Afterstudyingthispaper,studentswillacquiretheknowledgeon the synthesis and identification of organicmolecules.

Referencebooks:

1. PracticalOrganicChemistryA.I.Vogel(Longmans)
2. TextBookofpracticalorganicChemistryF.G.Mann&B.C.Sanders.
3. AManualofPracticalOrganicChemistrybyDaySitaramam&Govindachari
4. OrganicExperimentsL.F.Fieser.
5. PracticalOrganicChemistry H.T.Openshaw
6. SystematicIdentificationofOrganicCompounds,P.L.Shriner,R.C.Fuson&D.Y.Curtin.
7. IdentificationofOrganicCompoundsbyN.D.Cheronis&J.B.Entrilkin.
8. AdvancedOrganicSynthesisbyR.S.MonsonAcademicPress

KRISHNA UNIVERSITY, MACHILIPATNAM - 521003DEPARTMENTOFCHEMISTRY

M.Sc.,CHEMISTRY(ORGANICCHEMISTRY)

IIISEMESTER

PAPERCODE&TITLE:OCH309:ORGANICCHEMISTRY LAB-4

No.ofhoursperweek:06 **Totalcredits:03**

Totalmarks:100 **(Internal:30M& External:70M)**

Course Learning Objective(S): The main objective of this paper is to give a basic andupdatedknowledgeforthestudentsonAnalysisoforganicbinarymixturesandCharacterizationo forganiccompoundsusingIR,UV-Vis,^{1}Hand^{13}C-NMRspectralmethods.

- CharacterizationoforganiccompoundsusingIR,UV-Vis,^{1}H,and^{13}C-NMRspectralmethods.(Atleast20differentmolecules).

CourseLearningOutcome(S): Afterstudyingthispaper,studentswillacquiretheknowledgeofAn alysisoforganicbinarymixturesandCharacterizationoforganiccompoundsusingIR,UV-Vis,^{1}Hand^{13}C-NMR spectralmethods.

Referencebooks:

1. PracticalOrganicChemistryA.I.Vogel(Longmans).
2. TextBookofpracticalorganicChemistryF.G.Mann& B.C.Sanders.
3. AManualofPracticalOrganicChemistryby Day Sitaramam&Govindachari.
4. OrganicExperimentsL.F.Fieser.
5. PracticalOrganicChemistryH.T.Openshaw.
6. SystematicIdentification ofOrganicCompounds,P.L.Shriner,R.C.Fuson&D.Y.Curtin.
7. Identification ofOrganicCompoundsby N.D.Cheronis&J.B.Entrilkin.
8. Advanced OrganicSynthesisby R.S.Monson AcademicPress.
9. IntroductiontoSpectroscopybyD.L.Pavia,G.M.Lampman,G.S.Kriz,3rdEd.(Harcourtcollege publishers).
10. SpectrometricidentificationoforganiccompoundsR.M.Silverstein,F.X.Webster,6thEd.John WileyandSons.

KRISHNA UNIVERSITY, MACHILIPATNAM - 521003DEPARTMENTOFCHEMISTRY

M.Sc., CHEMISTRY (ORGANIC CHEMISTRY)

IIISEMESTER

Paper Code & Title: OCH 310CHEMISTRY INDAILY LIFE

No.ofhoursperweek:04 **Totalcredits:04**

Totalmarks: 100 **(Internal:30M &External:70M)**

Course Learning Objective(S): The main objective of this paper is to give a basic and updatedknowledge for the students on Chemistry Laboratory safety symbols – Meaning, EnvironmentalChemistry,BioinorganicChemistry, BiologicalfunctionsofHormonesandMedicinalChemistry.

Unit-I: Chemistry Laboratory safety symbols– Meaning: Corrosive, carcinogenic, Harmful,toxic,dangeroustoenvironment,Explosive,flammable,Narcotic,Oxidizing,Lachrymatory,Radioactive,irritant,gasesunderpressure,generallaboratorysafetyprecautions.

Unit-II: Environmental Chemistry: Ambient air quality standards, Acid rain, Smog,Greenhouseeffect,Bhopalgastragedy,Vishakhapatnampolymerindustry tragedy,RenewableandNon-renewable energy resources, Methods to convert temporary hard water into soft water,DO, COD,BOD,Toxicityoflead,mercury,arsenicandCadmium.

Unit-III: Bioinorganic Chemistry: Essential elements, biological significance of Na, K, Mg, Ca,Fe, Co, Ni, Cu, Zn and Cl. Metalloporphyrin – Structure and functions of hemoglobin, MyoglobinandChlorophyll.

Unit-IV: Biological functions of Hormones: Introduction, mechanism of action of Adrenaline,melatonin,noradrenaline,dopamine,prostacyclin,adrenocarticotropichormone,antidiuretichormone,Insulin.

Unit-V:MedicinalChemistry:Disease-medicinalmolecule-modeof action of thefollowingdiseasesMalaria-Artesunate,Dengue-Acetaminophen,Asthma-Albuterol,Diabetes(type-II)(iiddm)–metformin,Diabetes(type-I)(iddm)– Insulin,Arthritis-methotrexate,Glaucoma-brimonidine,Chickenpox-acyclovir, Anxiety – citalopram, Thyroid-Levithyroxine(lt4), Insomnia- estazolam,pepticulcer,GERD(acidreflux)–Omeprazole,pantoprazole.

Course Learning Outcome(S): After studying this paper, students will acquire the knowledge ofChemistryLaboratorysafetysymbols–Meaning,EnvironmentalChemistry,BioinorganicChemistry,Biologicalfunctions ofHormonesandMedicinalChemistry.

Reference Books:

1. Medicinal Chemistry by Ashotosh Kar
2. EnvironmentalChemistry,B.K.Sharma,GoelPublishers,2001.
3. LaboratorysafetyforChemistryStudentsbyRobertH. HillandDavidFinster
4. EnvironmentalChemistrybySamirK.Banerji
5. OrganicChemistrybyG.MareLoudan,PurdueUniversity
6. UnifiedChemistrybyO.P. Agarwal,Paper-III,JPNPPublications.

7. HormonesandEndocrinesystem–Kleine, Rossemanith.

KRISHNA UNIVERSITY, MACHILIPATNAM - 521003DEPARTMENTOFCHEMISTRY

M.Sc.,CHEMISTRY(ORGANICCHEMISTRY)

IIISEMESTER

PAPER CODE & TITLE: OCH 311 : ENVIRONMENTALCHEMISTRY

No.ofhoursperweek:04 **Totalcredits:04**

Totalmarks:100 **(Internal:30M& External:70M)**

CourseLearningObjective(S): Themainobjectiveofthispaperistogiveabasicandupdatedknowledgeforthestudentson EnvironmentalChemistry**.**

Unit-I:WaterPollution: Typesofwaterpollution,groundwaterandsurfacewaterpollution-Sourcesandharmful effects-sourcesandeffectsofmajorwaterpollutants-Inorganic pollutants and toxic metals-Oxygen demanding wastes-Organic Pollutants-Plantnutrients-detergents-suspended matter-radioactive wastes-Sediments-Thermal pollutants - oilspills-oilspillremovalmethods-diseasecausingagents.

Unit-II:AirPollution: Atmosphere-structure-functionsandphotochemicalreactions-sourcesof air pollution- Natural and manmade-classification and effects of air pollutants -CO, CO_2, SO_2, SO_3,NO and NO_2- hydrocarbon as pollutant- reactions of hydrocarbons andeffects - particulate pollutants- sources and effects of organic and Inorganic particulates -Greenhouse effect-impact on global climate-control measures-role of CFC's -ozone holes-effectsofozonedepletion-smog-componentsofphotochemicalsmog-effectsofphotochemicalsmog.

Unit-III:MetalToxicologyandNuclearPollution: Effectsofmetalsandmetalliccompounds-sources, toxicology and health risks of iron, arsenic, cadmium, chromium, lead,mercuryandnickel.Nuclearpollution-sources-effectsofionizingandnon-ionizingradiation - geneticandsomaticeffects-effectsofCesium-137,Krypton-85Iodine-131andStrontium-90-storageofnuclearwastes-disposalofnuclearwastes-nucleardisastersandtheirmanagement-somemajornuclearaccidents.

Unit-IV: PesticidesandSoilPollution: Pesticides-classification, mode of action-toxiceffects ofchlorinated hydrocarbons, organophosphorouscompounds andcarbamates-alternativestochemicalpesticides- (pheromones, Juvenile harmones,chemosterilization). Soil pollutants-sources and effects of industrial wastes-urban wastes-radioactive pollutants-agriculturalwastes-solid waste management in cities, soilpollutioncontrolmeasures.

Unit-V: AnalysisandControl: Sampling of polluted water- preservation-mainqualitycharacteristicsofwater- alkalinity, hardness, total solids- TDS - DO, BOD, COD, TOC,fluorideandchloride.Defluoridationtechniques-Ironremoval-samplingofgaseous

pollutants and particulates –adsorption - absorption - scrubbing – cold trapping – filtration - cycloneseparator-gravitysettling-electrostaticprecipitators-thermalprecipitators-analysisofCObygaschromatography,NObychemiluminescenceandSO2byspectrophotometer.

CourseLearningOutcome(S): Afterstudyingthispaper,studentswillacquiretheknowledgeon chemistry of Environment.

Textbooks/ Referencebooks:

1. EnvironmentalChemistry,A.K.De,Wiley EasternLtd,3rdEdn.,1994.
2. EnvironmentalChemistry,B.K.Sharma,GoelPublishers,2001.
3. EnvironmentalChemistry,M.S.Sethi,SriSaiPrintographers,1994.
4. Text book of Environmental Chemistry,C.D.Tyagiand M.Mehra, AnmolPublishers,1996.
5. FundamentalsofEnvironmentalPollution,K.Kannan,S.Chand&Co.,1997.
6. LaboratorysafetyforChemistryStudentsbyRobertH. HillandDavidFinster
7. ATextbookofEnvironmentalchemistrybyW.MooreandF.A.Moore
8. EnvironmentalChemistrybySamirK.Banerji
9. OrganicChemistrybyG.MareLoudan,PurdueUniversity
10. UnifiedChemistrybyO.P. Agarwal,Paper-III,JPNPPublications.
11. HormonesandEndocrinesystem–Kleine, Rossemanith.
12. PrinciplesofBiochemistry-Leninger.
13. EssentialsofMedicalpharmacology-K. D.Tripathi.

KRISHNA UNIVERSITY, MACHILIPATNAM - 521003DEPARTMENTOFCHEMISTRY

M.Sc.,CHEMISTRY(ORGANICCHEMISTRY)

IIISEMESTER

PAPER CODE & TITLE: OCH 312- TECHNIQUESFORMODERNINDUSTRIALAPPLICATIONS

No.ofhoursperweek:04 **Totalcredits:04**

Totalmarks:100 **(Internal:30M& External:70M)**

Course Learning Objective(S): The main objective of this paper is to give a basic andupdatedknowledge for the students onRecrystallization, Distillation, Solvent extraction,AdsorptionandPartitionChromatography,GasChromatographyandHigh-PerformanceLiquidChromatographyandIon-ExchangeChromatographyandElectrophoresis.

Unit-I: Classical Methods of purification: Recrystallization: Basic principles, choice ofsolvent, seeding, filtrationandcentrifugationand drying. Industrial applications. Conceptsof fractional crystallization. **Distillation: Basic principles**.Distillation types-continuousdistillation,batchdistillation,fractionaldistillation,vacuumdistillationandsteamdistillation.Industrial applications. **Solvent extraction:** Basic principles, Different types ofextraction. Selection of solvents. Avoiding emulsion formation. Basic concepts on Soxhletextraction.Industrialapplications.

Unit-II: Adsorption and Partition Chromatography: **Introduction to chromatography.**DifferenttypesofChromatography.Adsorptionchromatography-adsorbents,solvents,solutes,apparatus.ColumnChromatography-stationaryphase,Mobilephase,packingofcolumn, advantages anddisadvantages. **ThinLayerchromatography:**BasicPrinciples.Common stationary phases, Methods of preparing TLC plates, Selection of mobile phase,DevelopmentofTLCplates,Visualizationmethods,Rfvalue.ApplicationofTLCinmonitoringorganicreactions.identificationandquantitativeanalysis.**Paperchromatography:** Basic Principles.Ascending and descending types. Selection of mobilephase,Developmentofchromatograms,Visualizationmethods.Applicationofpaperchromatography in the identification of sugars and amino acids. One- and two-dimensionalpaperchromatography.

Unit-III: Gas Chromatography and High-Performance Liquid Chromatography: **Gaschromatography:** Basic Principles. Different types of GC techniques. Selection of columnsand carrier gases.Instrumentation. detectors; RT values. Applications in the separation,identification and quantitative analysis of organic compounds. **High Performance liquidchromatography(HPLC):**BasicPrinciples.Normal

andreversedPhases.Selectionofcolumn and mobile phase.Instrumentation.detectors; RT values.Applications in theseparation, identification and quantitative estimation of organic compounds.Concepts onHPLCmethoddevelopment.

Unit-IV:Ion-ExchangeChromatographyandElectrophoresis:Ionexchangechromatography:BasicPrinciples.Preparationofcross-linkedpolystyreneresins.Different types of cationandanoinexchange resins.Applicationinthe purificationofcarboxylic acids and amines. **Electrophoresis:** Basic Principles. Capillary electrophoresis.Instrumentation,applications,zone-electrophoresis,gel-electrophoresis.

Unit-V: GC-MS – Introduction: Instrumentation – GC – MS interface – Mass spectrometer(MS)Instrumentoperation,processingGC–MSdata–
ionchromatogramLibrarysearching
– Quantitative measurement – sample preparation Selected ion monitoring – Application ofGC-MSforTraceconstituents.Drugsanalysis,Environmentalanalysisandothers.

CourseLearningOutcome(S): Afterstudyingthispaper,studentswillacquiretheknowledge of Recrystallization, Distillation, Solventextraction, AdsorptionandPartitionChromatography, Gas Chromatography and High-Performance Liquid Chromatography andIon-ExchangeChromatographyandElectrophoresis.

Textbooks/ Referencebooks:

1. PrinciplesofInstrumentalAnalysisbyD.A.Skoog,F.J.HollerandT.A.Nieman,HarcourtCollegePub.
2. SeparationTechniquesby M.N.Sastri,HimalayaPublishing House(HPH),Mumbai.
3. IntroductiontoOrganicLaboratoryTechniques-D.L.Pavia,G.M.Lampman,G.S.KrizandR.G.Engel,Saunders CollegePub(NY).
4. InstrumentalMethods ofChemicalAnalysisbyH.Kaur,PragatiPrakashan,Meerut.
5. ProteinPurification-Principlesandpractice,IIIEdn-R.K.Scopes,NarosaPublishingHouse, Delhi.

KRISHNA UNIVERSITY, MACHILIPATNAM - 521003DEPARTMENTOFCHEMISTRY

M.Sc.,CHEMISTRY(ORGANICCHEMISTRY)

IVSEMESTER

PAPERCODE&TITLE:OCH 401:ADVANCEDORGANICSPECTROSCOPY

No.ofhoursperweek:04 **Totalcredits:04**

Totalmarks:100 **(Internal:30M& External:70M)**

Course Learning Objective(S): The main objective of this paper is to give a basic andupdated knowledge for the students on ^{13}C NMR Spectroscopy, Structural Elucidation ofOrganic compounds UsingUV, IR,^{1}H-NMR,^{13}C-NMR, 2D NMR spectroscopy, ElectronSpinResonanceSpectroscopyandOpticalRotatoryDispersion(ORD)andCDspectroscopy.

Unit-I: ^{13}C NMRSpectroscopy: Similarities andDifferences betweenPMR and CMR,general considerations, chemical shift (aliphatic, olefinic, alkyne, aromatic, hetero aromaticand carbonyl carbon), off resonance and broadband decoupling, coupling constants, typical examples of CMR spectroscopy-simplesystems.

Unit-II: 2D NMR Spectroscopy: Definitions and importance of NOE, COSY, DEPT, HOMCOR,HETCOR,INADEQUATE,INDOR,INEPT,NOESY,HOM2DJ,HET2DJ,DQFCOSY–COSYof mentholDEPTofethanol –thestudyofsimpleorganiccompounds.

Unit-III

ElectronSpinResonanceSpectroscopy: Introduction,BasicPrincipleandInstrumentation; Relaxation process and line widths; definition and examples of Zero fieldsplitting,Finesplitting,Hyperfinesplitting,SuperHyperfinesplittingandKramer‟sdegeneracy; Factors affecting the "g" value. Isotropic and anisotropic hyperfine couplingconstants,Hamiltonianandspindensities.

Unit-IV:OpticalRotatoryDispersion(ORD)andCDspectroscopy: PhenomenaofOptical Rotation, Circular birefringence, Circular dichroism and Cotton effect. Plane curvesand Anomalous curves. Empirical and semi empirical rules – The axial haloketone rule, theOctant rule and Helicity rule. Application of the rules to the study of absolute configurationandconfirmations oforganicmolecules.

Unit V: Structural Elucidation of Organic compounds: Structural Elucidation of OrganiccompoundsUsingUV,IR, ^{1}H-NMR,^{13}C-NMR andmassspectrometry

CourseLearningOutcome(S): Afterstudyingthispaper,studentswillacquiretheknowledge of ^{13}C NMR Spectroscopy, Structural Elucidation of Organic compounds UsingUV, IR, 1H-NMR,^{13}C-NMR, 2D NMR spectroscopy, Electron Spin Resonance SpectroscopyandOpticalRotatoryDispersion(ORD)andCDspectroscopy.

Textbooks/ Referencebooks:

1. IntroductiontoSpectroscopy– D.L.Pavia,G.M.Lampman,G.S.Kriz,3rdEd.(Harcourtcollegepublishers).
2. Spectrometricidentificationoforganiccompounds R.M.Silverstein,F.X.Webster,6thEd.JohnWileyandSons.
3. Spectroscopicmethodsinorganicchemistry-D.H.WilliamsandI.FlemmingMcGrawHill.
4. Absorptionspectroscopyoforganicmolecules–V.M.Parikh
5. NuclearMagneticResonance–BasicPrinciples-Atta-Ur-Rehman,Springer-Verlag(1986).
6. One-andTwo-dimensionalNMRSpectroscopy–Atta-Ur-Rehman,Elsevier (1989).
7. Organic structure Analysis-PhillipCrews, Rodriguez, Jaspars, OxfordUniversityPress(1998).
8. OrganicstructuralSpectroscopy-JosephB.Lambert,Shurvell,Lightner,Cooks,Prentice-Hall(1998).
9. Organicstructuresfromspectra– FieldL.D.,KalmanJ.R.andSternhellS.4thEd.JohnWileyandsons Ltd.

KRISHNA UNIVERSITY, MACHILIPATNAM - 521003DEPARTMENTOFCHEMISTRY

M.Sc.,CHEMISTRY(ORGANICCHEMISTRY)

IVSEMESTER OCH 402 Medicinal Chemistry

Course Learning Objective(S): The main objective of this paper is to teach students basic knowledge on medicinal chemistry with an extensive information on life saving drugs.

Unit : I Antibiotics: Definition**,** Synthesis, drug profile, Structure activity relationship (SAR)and activities of the antibiotics β-lactumantibiotics (Penicillin's, Cephalosporins) Chloramphenicol, aminoglycoside antibiotics (streptomycin), tetracycline.Antiviral: Acyclovir

Unit : IISulpha drugs : Classification, Synthesis, Structure activity relationship (SAR), and Activities of sulpha drugs : sulfanilamide, sulfapyridine, sulfathiazole, sulfadiazine, sulfaguanidine, sulfamerazine, sulfadimidine, sulfamethizole.

Unit : IIICNS Drugs Structure and synthesis of CNS Stimulant : Dextro-amphetamine, Respiratory Stimulant : Doxapram, CNS anti-depressant , Chlorpromazine (Antipsychotic), Diazepam (Anxiolytic), Phenobarbitol (Antiepileptic)

Unit : IVAnti inflammatory Drugs: Synthesis and activities of Naproxen, Ibuprofen , Oxaprozin, Diclofenac Sodium, Celecoxib.

UNIT V: Anti-hypertensive and Anti-diabetic Drugs: Structure and synthesis of Anti Hypertensive :Verapamil , Captopril, Atenolol, Diltiazem,Antidiabetics :Troglitazone, Chlorpropamide, Tolbutamide

Course Learning outcome(S): Students taking this course will haveextensive knowledge on antibiotics, sulpha drugs, CNS drugs, anti hypertensive and anti diabetic drugs and anti inflammatory drugs.

Recommended text Books:

1. FOYE'S Principles of Medicinal Chemistry VIth Edition: Thomas L. Lemke, David A. Williams, Victoria F. Roche and S. William Zito.
2. Introduction of Medicinal Chemistry: A. Gringuage, Wiley-VCH.
3. Synthesis of Essential Drugs: R. S. Vardanyan and V. J. Hruby.
4. Volumes of Burger's Medicinal Chemistry: M. E. Wolf, JohnWiley.
5. Essentials of Medicinal Chemistry IInd: AndrejusKorolkovas, WileyVCH.
6.Strategies for organic drug synthesis and designing - D. Lednicer Wiley
7.Medicinal Chemistry- Ashutosh Kar

KRISHNA UNIVERSITY, MACHILIPATNAM – 521003DEPARTMENTOFCHEMISTRY

M.Sc.,CHEMISTRY(ORGANICCHEMISTRY)

IVSEMESTER

PAPERCODE &TITLE:OCH403 :CHEMISTRY OF NANO MATERIALS

No.ofhoursperweek:04 **Totalcredits:04**

Totalmarks:100 **(Internal:30M& External:70M)**

Course Learning Objective(S): The main objective of this paper is to give a basic andupdatedknowledgeforthestudentsonNanoChemistry.

Unit-I: IntroductiontoNano chemistry: Definitionof terms-nanoscale, nanomaterials,nanoscience,nanotechnology-scaleofmaterialsnaturalandmanmade-nanoscience practicedduringancientandmodernperiods-contributorstothefieldofNanochemistry.

Unit-II:SynthesisofNanomaterials: Topdownandbottom- up approaches-synthesisofcarbonnanotubes, Nano spears, Nano rods,quantumdots,goldandsilvernanoparticles.

Unit-III: Characterizationof Nanomaterials: Powder XRD, XPS,Electron microscopy techniques-scanningelectronmicroscopy,transmissionelectronmicroscopyandatomicforcemicroscopy.

Unit-IV: Application of Nanomaterials: Solar cells-smart materials-molecular electronics-biosensors-drugdeliveryandtherapy-detectionofcancerous cells.

Unit-V:NanochemistryinNature: Thesciencebehindthenanotechnologyinlotuseffect-self-cleaningpropertyoflotus-geckofoot climbingabilityofgeckos-waterstrider-anti wettingpropertyofwaterstriders-spidersilk mechanicalpropertiesofthespidersilk.

CourseLearningOutcome(S): Afterstudyingthispaper,studentswillacquiretheknowledgeofNanoChemistry.

Textbooks/ Referencebooks:

1 Nano TheEssentials:UnderstandingNanoscienceandNanotechnology,T.Pradeep,McGraw-HillProfessionalPublishing,2008.
2 IntroductiontoNanoscience,J.Dutta,H.F.TibbalsandG.L.Hornyak,CRCpress,BocaRaton,

2008.

KRISHNA UNIVERSITY, MACHILIPATNAM - 521003DEPARTMENTOFCHEMISTRY
M.Sc.,CHEMISTRY(ORGANICCHEMISTRY)
IVSEMESTER

PAPERCODE&TITLE:OCH404 GREENCHEMISTRY

No.ofhoursperweek:04 **Totalcredits:04**

Totalmarks:100 **(Internal:30M& External:70M)**

Course Learning Objective(S): The main objective of this paper is to give a basic andupdatedknowledgeforthestudentsonGreenchemistry.

Unit-I: Fundamentalsand significance of Green Chemistry: Discussion of the currentstate of chemistry and the environment and the definition of green chemistry. Assessment ofthe impact of chemistry in the environment and definition of risk hazard. An introduction tothetools ofgreenchemistryandits fundamentalprinciples.e-factor.

Unit-II: Principlesof GreenChemistry: Prevention of waste / by-products, Hazardousproducts-Designingofsaferchemicals-Selectionofappropriatesolventsandstartingmaterials-Useofprotectinggroups andcatalysis-Designingofbiodegradableproducts.

Unit-III:Microwaveassistedreactions:
IntroductiontoMicrowaveorganicsynthesis,Applications:solvents(waterandorganicsolvents),solventfreereactions(solidstatereactions), Phase transfer catalysis-Principle,Types, advantagesandapplications,Crownethers.

Unit-IV:SolventFreeReactions: Solventfreetechniques-Reactionsonsolidmineralsupports,PhaseTransferCatalysis-C-alkylation,N-alkylation,Darzen"sreaction,Wittigreaction.Ultrasoundassistedgreensynthesis-Oxidation,Reduction,Hydroboration,Streckerreaction.

Unit-V:Ionicliquids: Definition-TypesofIonicLiquids-SynthesisofIonicLiquids-Selection of ionic liquids- physical properties- Application in organic synthesis-alkylation,allylation,oxidation,reduction,polymerization,hydrogenation,hydroformylation,alkoxycarbonylation,carbon-carbonbondformingreactions,alkenemetathesis.

CourseLearningOutcome(S): Afterstudyingthispaper,studentswillacquiretheknowledgeon microwave reactions, solvent free reactions, ionic liquids utilization, Greenmethodologies in synthesis.

Textbooks/Referencebooks:

1. NewTrendsinGreenChemistrybyV.K.Ahluwalia,M.Kidwai.
2. GreenChemistry:EnvironmentFriendlyAlternatives byRashmiSanghi,MMSrivastava
3. GreenSolvents forOrganicSynthesisbyV.K.Ahluwalia,RajenderS.Varma
4. GreenAnalyticalChemistrybyMihkelKoel andMihkelKaljurand.

KRISHNA UNIVERSITY, MACHILIPATNAM - 521003DEPARTMENTOFCHEMISTRY

M.Sc.,CHEMISTRY(ORGANICCHEMISTRY)

IVSEMESTER

PAPERCODE&TITLE:OCH 405Supramolecular Chemistry

Course Learning Objective(S): The main objective of this paper is to train students on supramolecular chemistry.

UNIT-I: Fundamentals of Supramolecular Chemistry : Terminology and definitions in supramolecular chemistry. Intermolecular forces: Ion pairing, ion-dipole and dipole-dipole interactions; hydrogen bonding; cation-pi, anion-pi, pi-pi interactions and Van der Waal forces. Solvent and solution properties, solvation and hydrophobic effect. Binding constants; definition and use, determination of binding constant by physical methods.

UNIT-II: Molecular Recognition : Principle of molecular recognition, host-guest complementarity, preorganisation, chelate effect, cooperativity. Synthesis and applications of supramolecular host (crown ethers, lariat ethers, podands, cryptands, spherands, calix[n]arenes, cyclodextrine) as cation and anion binding receptors and receptors for ion-pair recognition. Molecular motor.

UNIT-III: Supramolecular Chemistry in Life : Ionophores, Porphyrin and other Tetrapyrrolic Macrocycles, Coenzymes, Neurotransmitters, DNA and Biochemical Self-assembly.

UNIT-IV: Supramolecular Reactivity and Catalysis :Organocatalysis mediated through hydrogen bonding, preconcentration, self-assembly of catalysts and preorganisation of catalyst-substrate systems. Influence of organization (effective molarity) on catalysis, Catalytic acyl transfer, acid-base catalysis, catalysis hydrolysis as ATPase mimic

UNIT-V: Supramolecular two and three dimensional Architectures :host-guest chemistry, molecular devices and functional supramolecular structures – molecular wires, sensors, switches and logic gate devices, metal-organic frameworks and their applications, nucleobases as supramolecular motifs.

Course Outcome: students opting this paper will have extensive knowledge on supramolecular chemistry and its utility.

References:

1. "Supramolecular Chemistryby J. W. Steed & J. L. Atwood, 1st Edn John Wiley, 2009.
2. Supramolecular Chemistry: Concepts and Perspectives, J. M. Lehn, 1st Edition, VCH, 1995.
3. H. Dodziuk, Introduction to Supramolecular Chemistry, 1st Edition, Springer, 2001. 4. Supramolecular Chemistry: Fundamentals and Applications, Katsuhiko, 1 st Edition Springer, 2006.
4. Core Concepts in Supramolecular Chemistry and Nanochemistry by J. W. Steed, D. R. Turner, K. J. Wallace (2007).
5.Supramolecular Chemistry – Fundamentals and Applications. Advanced Textbook by T. Kunitake, K Ariga, Berlin: Springer-Verlag Heidelberg, 2006. 208 p. ISBN 978-3-540- 01298-6.

KRISHNA UNIVERSITY, MACHILIPATNAM-521003

Department of Chemistry

M.Sc., ORGANIC CHEMISTRY IV SEMESTER

Reagents in Organic synthesis **Code: OCH406**

No. of hours per week: 04 Total credits: 04
Total marks: 100 (Internal: 30 M & External: 70 M)

Course Learning Objective(S): The main objective of this paper is to give a knowledge for students on various reagents used in Organic synthesis.

Unit-1:Ylides: Preparation and their synthetic applications along with their stereochemical aspects ofPhosphorous, Sulphur and Nitrogen ylides. Horner-wordsworth-Emmons reaction, Reactions of **phosphonate-stabilized carbanions and** quarternary phosphonium compounds.

Unit-2:Coupling reagents : DCC, CDI, HATU, HOBT, Click Chemistry reagents, Peptide coupling reagents, phase transfer reagents

Unit 3: Reduction of Hydrocarbons: alkenes, alkynes, and aromatic rings. Synthetic applications of the following reagents in organic synthesis:Anhydrous Aluminium chloride, Borontriflouride, Dithianes, Diazomethane

Unit-4: Hydride transfer reagents: L-selectride, K-selectride, Luche reduction, and Bu_3SnH. Synthetic applications of Electron transfer reduction-metal in acid; examples of Reduction by dissolving metals-metal in ammonia; Reduction of Hydrocarbons: alkenes, alkynes, and aromatic rings, Reduction of Carbonyl compounds - aldehydes, ketones, carboxylic acids, Nitro, nitroso, azo and oxime group.

Unit-5: Reactions with Miscellaneous Reagents:Dess-Martin Periodinane,.Lawesson'sreagent, Etard reaction. PhSeBr, Moffatt oxidation.Hypervalent iodine reagents - DMP and IBX; Silver based reagents - Fetizon's reagent

Course Learning Outcome(S): After studying this paper, students will acquire the knowledge of most routinely used reagents used in Organic synthesis.

Reference books:

1.Organic Chemistry: Clayden, Greeves, Warren and Wothers
2. Stereochemistry of Organic Compounds (Principle and application): D. Nasipuri
3. Stereochemistry of Organic compounds: Ernest L. Eliel / Samuel H. Wilen
4. Organic Synthesis: W. Carruthers
5. Organic Reagents: Fieser&Fieser
6. Organic Synthesis: M. B. Smith
7. Advanced Organic Chemistry; Part A and B: F. A. Carey & R. J. Sundberg

KRISHNA UNIVERSITY, MACHILIPATNAM-521003

Department of Chemistry

M.Sc., ORGANIC CHEMISTRY IV SEMESTER

Molecular Modelling - OCH 407 Molecularmodelling

No. of hours per week: 04 Total credits: 04
Total marks: 100 (Internal: 30 M & External: 70 M)

Course Learning Objective(S): The main objective of this paper is to impart basic knowledge on quantum mechanics and molecular modelling to students.

Unit-I : Introduction , Methodologies : Molecular Modelling , Quantum Mechanics (or Quantum Mechanical Methods), charge and electrostatics, parameterization of force fields, chemical reaction(s) modeling and design of transition state inhibitors

Unit-II :KnownReceptor Sites - 3D Structure of macromolecular targets, structure-based drug-design, major steps in structure-based drug design, ligand receptor recognition, active site for a target molecule, characterization of site, hydrogen bonding and other group binding sites. electrostatic and hydrophobic fields.

Unit-III: Design of Ligands - visually assisted design, 3D databases, 'divide and rule' concept in design of ligands, *de novo* design, calculation of affinity, components of bonding affinity, simulations and the thermodynamic cycle, multiple binding modes.

Unit-IV : Unknown Receptor Sites - Pharmacophore *Vs* Binding-site models,pharmacophore models,binding-site models , molecular extensions, activity *vs* affinity, visualization of molecular properties, molecular comparisons.

Unit V : Reverse Designing - high throughput screening, combinatorial chemistry, CADD-methods -comparison for determining relative binding affinities of COX-2 Inhibitors

Course Learning Outcome(S): After studying this paper, students will acquire the knowledge on drug designing and molecular modelling and the insights required to develop new drugs.

REFERENCE BOOKS:

1. A. R.Leach - Molecular Modeling Principles and Application, 2nd edition, Longman Publications, 1996.
2. Medicinal Chemistry – Ashutosh Kar.

KRISHNA UNIVERSITY, MACHILIPATNAM-521003

Department of Chemistry

M.Sc., ORGANIC CHEMISTRY IV SEMESTER

OCH 408 - Organic Chemistry Lab-5

No.ofhoursperweek:06 **Totalcredits:03**

Totalmarks:100 **(Internal:30M& External:70M)**

Course Learning Objective(S): The main objective of this paper to train the chromatographic techniques which are useful in the identification, synthesis , purification and chraracterization of organic molecules.

1. **Rf value**
2. **TLC**
3. **Column chromatography**
4. **Paper Chromatography**

Course Learning Outcome(S): After studying this paper, students will acquire the knowledge on chromatographic techniques which are useful in the identification, synthesis, purification and characterizationof organic molecules.

KRISHNA UNIVERSITY, MACHILIPATNAM-521003

Department of Chemistry

M.Sc., ORGANIC CHEMISTRY IV SEMESTER

OCH 409-DRUGDESIGNANDDRUGCHEMISTRY

Course Learning Objective(S): The main objective of this paper is to give a basic andupdatedknowledgeforthestudentson drug chemistry and drug Design.

UNITI:IntroductiontoDrugs: GeneralClassification,nomenclature,drugmetabolism.Developmentofdrugs:Procedure followedin drug design, concepts of leadcompoundleadmodification, concept of prodrugs,StructureActivityRelationship(SAR)-factorsaffectingbio-activity-

resonance,inductive effect,isosterism,bio-isosterism,spatialconsiderations,QuantitativeStructureActivity Relationships(QSAR)-Conceptsofdrugreceptors.Elementarytreatmentofdrugreceptor interactions.Physico-chemicalparameters:lipophilicity,partitioncoefficient,electronicionization constants, steric, Shelton and surface activity parameters and redox potentials.

UNITII:AntineoplasticAgents: Introduction, classification-alkylating agents- mechanism and mode of action, nitrogen mustards-synthesis, properties, uses and dosage - Chlorambucil, cyclophosphamide and melphalan. Antimetobolites- synthesis, properties, uses and dosage-pyrimidine analogues-5- flurouracil, purine analogues-6-mercaptopurine, folic acid analogues-Methotrexate.Antibiotics-structure, properties and dosage-Doxorubicin, Mitomycin.

UNITIII:CardiovascularDrugs: Introduction, cardiovascular diseases, drug inhibitors of peripheral sympathetic function,centralintervention of cardiovascularoutput.Directacting arteriolar dilators.Synthesisof amyl nitrate, sorbitrate, diltiazem, quinidine, verapamil, methyldopa, atenolol, oxyprenolol.

UNIT IV: Oral Hypoglycaemic Drugs: Introduction, Classification, Sulphonylureas- synthesis, mode of action, properties, uses and dosage- tolbutamide, glipizide. Biguanides- synthesis, mode of action, properties, uses and dosage-Metformin. α-glucosidage inhibitors-synthesis, mode of action, properties, uses and dosage- Miglitol. Dipeptidyl Peptidase-4 (DPP-4) inhibitors-synthesis, mode of action, properties, uses and dosage-saxagliptin and sitaglipti

UNIT V: Local Anti-infective & Antiviral drugs: Local Anti-infective Drugs: Introduction and general mode of action. Synthesis of sulphonamides, ciprofloxacin, norfloxacin, dapsone, amino salicylic acid, isoniazid,fluconazole, econozole and chloroquin.

Course outcome: After completing this course student will have the knowledge on drug chemistry and drug design.

TextBooks:

1. Textbookofmedicinalchemistry,Volume1& II,Thirdedition by V Alagarsamy, CBS-publishers
2. IntroductiontoMedicinalChemistry,AGringuage,Wiley-VCH.
3. WilsonandGisvold'sTextBookofOrganicMedicinalandPharmaceutical Chemistry,Ed Robert F. Dorge.
4. AnIntroductiontoDrugDesign,S.S.PandeyaandJ.R.Dimmock,NewAge International.
5. Burger'sMedicinalChemistryandDrugDiscovery,Vol-1(Chapter.-9andCh-14), Ed. M. E. Wolff, John Wiley.
6. GoodmanandGilman'sPharmacologicalBasisofTherapeutics,McGraw-Hill.
7. The Organic Chemistry of Drug Design and Drug Action, R. B. Silverman, Academic Press.
8. StrategiesforOrganicDrugSynthesisandDesign,D.Lednicer,JohnWiley.

KRISHNA UNIVERSITY, MACHILIPATNAM - 521003 DEPARTMENT OF CHEMISTRY
M.Sc., CHEMISTRY (ORGANIC CHEMISTRY)
IV SEMESTER

PAPER CODE & TITLE: OCH 410ENERGY, ENVIRONMENT AND SOIL CHEMISTRY

Course Learning Objective(S): The main objective of this paper is to give a basic andupdatedknowledge on energy sources, environment and Soil chemistry.

UNIT-ISources of Energy : Fossil fuels- Nuclear fission and fusion- Solar energy-use of solar energy in space heating and waterheating- production of electricity using solar energy-solar trough collectors- power tower- solar pond- solarenergy for driving vehicles- power from indirect solar energy – Hydropower- wind power- Biomass energy-production of ethanol

from biomass- production of methane from biomass- photosynthesis- photo electrochemistry- Geothermal energy.

UNIT-II **Water Resources** Hydrological cycle- physical and chemical properties of water- complexation in natural and waste water, Anomalous properties-water pollutants-Types- Sources- Heavy metals- metalloids- organic –Inorganic –Biological and Radioactive-Types of reactions in various water bodies including marine environment-Eutrophication- Ground water- Potable water standards. Treatment for portable water.

UNIT-III Air: Chemical reactions in the atmosphere – Aerosols types- Production and distribution – Aerosols andRadiation – structure and composition of atmosphere- temperature inversion – Global warning- Ozone depletion– Green house effect, "CFC"s- Acid rain.

UNIT-IV Soil : Composition of soil- lithosphere- inorganic and organic contaminants in the soil- Biodegradation-Nondegrdable waste and its effect on the environment- Bioremediation – of surface soils- Fate and transport ofcontaminants on soil system– Bioindicators- Soil parameters- soil destruction- Erosion- Soil conservation –Nitrogen pathways and NPK in soil.

UNIT-V Soil pollution: Introduction – soil pollution by industrial wastes. soil pollution by urban wastes, Radioactive pollutants andAgricultural waste- chemical and metallic pollutants- Biological agents – mining - Detrimental effects of soilpollutants – Effects of industrial pollutants- Effects of sewage and domestic wastes- Effects of heavy metals-Effects of radioactive pollutants- Effects of modern agro- technology – Diseases caused by soil pollution – solidwaste management – sources and classification -public Health Aspects – methods of collection- Disposalmethods – potential methods of disposal.

Course Learning Outcomes : Students will acquire knowledge on soil chemistry and will be directive to protect the soil and atmosphere from pollution.

Reference Books:

1. Daniel D.Chiras (1994), Environmental Science, 4th Ed.
2. Environmental Chemistry by W. Moore and J.Moore
3. Environmental chemistry by J.O.M. Bockariss
4. Environmental by BK Sharma
5. Environmental chemistry by SS Dara
6. Environmental chemistry by Mahajan

KRISHNA UNIVERSITY, MACHILIPATNAM-521003

Department of Chemistry

M.Sc., ORGANIC CHEMISTRY IV SEMESTER

OCH 411- Catalysis for Organic SYNTHESIS

Course Learning Objective(S): The main objective of this paper is to cover an advance level of catalysis and recent development of catalytic reagents and their applications in organic synthesis,

Unit 1 : Introduction to Catalysis: types of catalysis , terminologies, used in catalysis (TON, TOF, Precatalysts, induction time, resting state, catalytic loop)., distinguish homogeneous and heterogeneous catalysis.

Unit II: Ligand Substitution Reactions, Oxidative Addition [1.Concerted Mechanism], Oxidative Addition [2.SN2 Mechanism], Oxidative Addition[3.RadicalMechanism],Reductive Elimination, Insertion, elimination and transmetalation

Unit III :Metal mediate organic synthesis : oxidative couplings using iron, cupper, cobalt, ruthenium. Hydrogenation of Alkenes, Hydrosilation reaction, Hydroformylation reaction, Alkene dimerization, Alkene polymerization, Monsanto acetic acid process, Wacker process,I: Metal complexes mediated organic synthesis,Metathesis of olefins and alkynes ,Buchwald-Hartwig coupling reaction ,Kulinkovich Reaction and its mechanism,Pauson–Khand.

Unit IV Organo catalysis: Proline,chincona alkaloids, thiourea catalyzed reactions

Unit V: Enzymes as catalysts: lock and key mechanism, yiest as catalyst, protolyticenzymes ,prototopic enzymes, lipases as catalysts. Trans amylases as catalysts.

Course outcome: The outcome of this course is the student opting this course will have complete knowledge on catalysis and the organic synthesis mediated by the catalysts.

Reference books:

1.Organo transition chemistry crabtraee
2. Organometallic Chemistry – R C Mehrotra and A Singh, New Age Publications
3. Inorganic Chemistry- Principles of Structure and Reactivity, James E Huheey, Ellen A. Keiter, Richard L. Keiter, Pearson Education
4. Advanced Inorganic Chemistry- F A Cotton, G Wilkinson, Carlos A. Murillo, Manfred Bochman- John wiley and Sons.
5. Inorganic Chemistry – Allan G Sharpe, Addison Wesley
6. Organic Synthesis – Michael B.Smith (2^{nd} Edition – McGraw Hill
7. Name Reactions – Jie Jack Li – (2^{nd} Edition – Springer)
8. Organic Chemistry – Clayden, Greeves, Warren and Wothers (Oxford University Press)
9. Advanced Organic Chemistry – Francis A.Carey and Richard J.Sundberg – Part B – Reactions and Synthesis. Kluwer Academic / Plenum Publishers.
10. Advanced Organic Chemistry – Francis A.Carey and Richard J.Sundberg – Part A – Structure and Mechanisms – Kluwer Academic / Plenum Publishers.