

S.C.I.M. GOVT. COLLEGE (AUTONOMOUS), TANUKU

Accredited by NAAC 'A' grade with CGPA 3.18

(Affiliated to Adikavi Nannaya University, Rajahmundry)



POST GRADUATION

BOARD OF STUDY

ACADEMIC YEAR 2025-26

**DEPARTMENT OF CHEMISTRY
(FIRST YEAR & SECOND YEAR)**

DATE: 22/09/2025

S.C.I.M. Govt. College (Autonomous):: Tanuku

Department of chemistry

Board of studies for the A.Y. 2025-26

Members present with signatures The Board of Studies of chemistry Department is convened on 22 Septmeber, 2025 from 11:00AM onwards in the Studio Centre under the Chairmanship of Dr. K. Raveendrababu, Head of the Department Chemistry. The following members are present in the meeting.

S.No	NAME	POSITION	ADDRESS	SIGNATURE
1	Dr. K. Raveendrababu	Chairperson	SCIM Govt. College (A),Tanuku	
2	Dr. T. Narasimha Murthy	University Nominee	Government College (A), Rajahmundry	
3	Prof. R. Balamurugan	Guest Of Honor	University of Hyderabad, Hyderabad, Telangana	
4	Prof. M. Bhanuchandra	Subject Expert	Delhi University, Delhi	
5	Dr. M. Malyadri	Subject Expert	SRR&CVR Govt. College (A) Vijayawada	
6	Dr. N. Vijay Kumar	Industry Expert	Wanbury Pvt. Limited, Tanuku	
7	Dr. M. Trinadh	Subject Expert in Physical Chemistry	Government College (A) Rajahmundry	
8	Dr. P. Kamala	Staff member	SCIM Govt. College (A),Tanuku	
9	Kum. T. Keerthi Poorna	Staff member	SCIM Govt. College (A),Tanuku	
10	A. Naga Satish	Alumni	Ph.D Student,VIT, Amaravathi, Andhra Pradesh	

**SCIM GOVERNMENT COLLEGE (A),
DEPARTMENT OF CHEMISTRY
POST GRADUATE BOARD OF STUDIES MEETING 2025-26**

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AGENDA :

1. To design course structure (hours for week and credits) for M.Sc.Organic Chemistry programmes for all Semesters I,II, III&IV.
2. To prepare syllabus for M.Sc. Organic Chemistry Programmes for all Semesters I,II, III &IV.
3. To prepare external and internal assessment pattern.
4. To prepare Blue print and model question papers for all courses.
5. To approve the syllabus/hours for Add on programmes.
6. To approve academic activities of the department.
7. Any other proposal with the permission of the chair.

MINUTES OF THE PG BOARD OF STUDIES MEETING, SEPTEMBER-2025

DATE: 22-09-2025

TIME:11:00AM

The Board of studies meeting of Chemistry Department is convened on 22nd September at 11:00AM under the Chairmanship of Sri.Dr.K.Raveendra Babu, Head of the department. The members discussed designing of the syllabus & model question papers for I and II year M.Sc., Chemistry syllabus for all the three specialisations ie., Organic chemistry programmes both for theory and practical for implementing them for the academic year 2025-26.

RESOLUTIONS:

Academic year: 2025-26

Evaluation process	Theory : 100M Practical : 100M
Theory	Internal : 40M (CIA) External : 60M
Practical	Internal: 40M External:60M

Theory - Internal Assessment (CIA Format)

S.No	Type of Assessment	Weightage Assigned
1.	Assignments	10
2.	Project-Work/Seminar/Group Discussion,/Role play/Quizzes/Presentations	10
3.	Attendance and NSS activities (Cleaning, Greening)	20
4.	Testing of knowledge though Mid-term examinations (Mid -1 + Mid -2)	20+20
	TOTAL	80 Marks

Scale down to 40 Marks

Chairman
Board of studies
Department of Chemistry

**DEPARTMENT OF CHEMISTRY, SCIM GOVT. COLLEGE (A)- TANUKU
ALLOCATION OF CREDITS FOR M.Sc. CHEMISTRY COURSES 2025-26**

S. No.	Semester	Code of the paper	Title of the paper	Theory/ Practical /Viva	Internal marks	External marks	Total marks	Credits
1.	Semester- I		General Chemistry-I	T	40	60	100	4
2.			Inorganic Chemistry-I	T	40	60	100	4
3.			Organic Chemistry-I	T	40	60	100	4
4.			Physical Chemistry-I	T	40	60	100	4
5.			Inorganic Chemistry Practical-I	P	40	60	100	3
6.			Organic Chemistry Practical-I	P	40	60	100	3
7.			Physical Chemistry Practical-I	P	40	60	100	3
8.	Semester- II		General Chemistry-II	T	40	60	100	4
9.			Inorganic Chemistry-II	T	40	60	100	4
10.			Organic Chemistry-II	T	40	60	100	4
11.			Physical Chemistry-II	T	40	60	100	4
12.			Inorganic Chemistry Practical-II	P	40	60	100	3
13.			Organic Chemistry Practical-II	P	40	60	100	3
14.			Physical Chemistry Practical-II	P	40	60	100	3
15.	Semester- III		Organic Reaction Mechanism And Pericyclic Reactions	T	40	60	100	4
16.			Organic Spectroscopy	T	40	60	100	4
17.			Organic Synthesis-I	T	40	60	100	4
18.			Chemistry of Natural Products	T	40	60	100	4
19.			Multi-step Synthesis of Organic Compounds	P	40	60	100	4
20.			Chromatographic Separation and Isolation & identification of Natural Products	P	40	60	100	4
21.	Semester- IV		Asymmetric Synthesis and Organic Photochemistry	T	40	60	100	4
22.			Organic Spectroscopy & Chromatography	T	40	60	100	4
23.			Organic Synthesis-II	T	40	60	100	4
24.			Bio-Organic Chemistry	T	40	60	100	4
25.			Estimations and Chromatography	P	40	60	100	4
26.			Spectral Identification of Organic Compounds(UV,IR, ¹ H-NMR, ¹³ C-NMR&MASS)	P	40	60	100	4
27.			Comprehensive viva-voce	V	----	50	50	2
					Total Credits			100

SCIM Government College (A)-TANUKU

(Accredited by NAAC -A 3.18/4.00CGPA)

Department of Chemistry

Certificate of Submission

These following documents are submitted to the Academic Coordinator and Controller of Examinations:

1. Hard copy of the approved curriculum which includes minutes of P.G. Board of studies, approved syllabus, blue print for the question papers and model question papers for all semesters and list of approved examiners .
2. CD containing the approved curriculum which includes minutes of P.G. Board of Studies, approved syllabus, blue print for the question papers and model question papers for all semesters and list of approved examiners.

I SEMESTER

SCIM GOVT COLLEGE (A) TANUKU
M.Sc (Previous), Organic Chemistry Syllabus Semester-I,
Course Code:
With effect from 2025-26 Admitted batch
Paper- I: GENERAL CHEMISTRY-I

UNIT-1 Basic Quantum Chemistry-I

Historic background, quantum mechanics vs classical mechanics, Failure of classical mechanics, wave particle duality, uncertainty principle; Wave equation- interpretation of wave function- properties of wave function- normalization and orthogonalisation, Operators- linear and non-linear- commutators of operators. Postulates of quantum mechanics; setting up of operators to observables; Hermitian operator- Eigen values and Eigen functions of Hermitian operator; Expansion theorems. Eigen functions of commuting operators-significance. Simultaneous measurement of properties and the uncertainty principle. particle in one dimensional box.

UNIT-II Molecular symmetry and Group Theory in chemistry:

Basic concepts of symmetry and Group theory-Symmetry elements, symmetry operations and point groups- Schoenflies symbols- Classification of molecules into point groups- Axioms of Group theory- Group multiplication tables for C_{2v} and C_{3v} point groups- Similarity transformations- and classes- Representations- reducible and irreducible representations, Mullikan symbols, Orthogonality theorem and its implications, Character table and its anatomy.

UNIT-III Fundamentals of Molecular Spectroscopy-I

Microwave and IR- Spectroscopy- Rotational spectra of diatomic molecules Rigid rotor- Selection rules- Calculations of bond length- Isotopic effect, Second order stark effect and its applications. Infrared spectra of diatomic molecules- harmonic and anharmonic oscillators- Selection rules- Overtones- Combination bands- Calculation of force constant, anharmonicity constant and zero point energy. Fermi resonance, simultaneous vibrational-rotational spectra of diatomic molecules.

UNIT- IV Fundamentals of Molecular Spectroscopy-II

Raman and Electronic Spectra- Classical and quantum mechanical explanations- Rotational Raman and Vibrational Raman spectra. Electronic spectra of diatomic molecules- Vibrational Coarse structure- intensities of spectral lines- Franck-Condon principle- applications, Rotational Fine structure- band head and band shading. Charge transfer spectra .

References/ Text books:

Fundamentals of Molecular spectroscopy: by C.N. Banwell
Molecular spectroscopy: by B.K. Sharma
Molecular spectroscopy: by Aruldas
Introductory quantum mechanics: by A.K. Chandra
Quantum chemistry: by R.K. Prasad
Quantum Chemistry by Ira N Levine

SCIM GOVT COLLEGE (A) TANUKU
M.Sc Organic Chemistry Examination Semester-I,
Course Code:
(w.e.f. 2025-26 Admitted batch)
Paper- I: GENERAL CHEMISTRY-I

Blue Print

Sl. no	Unit no.	Unit name	Essay questions(10M)	Short questions(4M)	Total questions
1	I	Basic Quantum Chemistry-I	2	2	4
2	II	Molecular symmetry	2	2	4
3	III	Fundamentals of Molecular Spectroscopy-I:	2	2	4
4	IV	Fundamentals of Molecular Spectroscopy-II	2	2	4
Total questions			8	8	16

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. Organic Chemistry Examinations Semester-I,
Paper Code:
General chemistry-I
(w.e.f. 2025-26 Admitted batch)

Model question paper

Total marks:60M

SECTION-A

Answer all questions:

(4x10=40marks)

1. Give a detail account of setting up of operators for different observables

OR

2. Discuss the postulates of quantum mechanics.

3. What is great orthogonality theorem? Explain its significance with an example.

OR

4. Explain the group multiplication tables for C_{2v} and C_{3v} point groups

5. i) Derive an expression for the rotational energy of rigid rotor. What are the selection rules?

ii) The microwave spectrum of BrF exhibits a series of absorptions 0.714 cm^{-1} apart. Using the masses $79\text{Br}=78.92$ and $19\text{F}=19.0$, calculate the moment of inertia and inter nuclear distance.

OR

6) What is an anharmonic oscillator? Write the vibration selection rules and obtain the expressions for zero point energy, fundamental transition and first & second overtones.

7) i) How do you explain Raman spectrum on the basis of classical and quantum mechanical theories?

ii) Write the selection rules and explain the nature of pure rotational and pure vibrational Raman spectra.

(OR)

8) Describe the origin of PQR spectrum in rotational fine structure of the electronic spectrum of a diatomic molecule.

SECTION-B

Answer any FIVE questions.

5X4=20M

1. What are Hermitian operators? Prove that Kinetic energy operator is Hermitian.

2. Write Born interpretation and properties of an acceptable wave function.

3. Define symmetry element and symmetry operation.

4. Give examples of molecules belonging to C_{2v} and C_{3v} point groups.

5. Explain Fermi resonance?

6. Write a short note on second order stark effect

7. Explain the terms combination bands and hot bands.

8. How do you deduce the force constants of a diatomic molecule both in ground state and excited state using vibrational coarse structure of its electronic spectrum?

SCIM GOVT COLLEGE (A) TANUKU
M.Sc (Previous), Organic Chemistry Syllabus Semester: I,
Course Code:
(w.e.f 2025-26 Admitted batch)

Paper- II: INORGANIC CHEMISTRY-I

UNIT-I: Structure & Bonding:

Applications of VSEPR, Valence Bond and Molecular orbital theories in explaining the structures of simple molecules- role of p and d orbitals in pi bonding. Application of MO theory to square planar (PtCl_4^{2-}) and Octahedral complexes (CoF_6^{3-} , $\text{Co}(\text{NH}_3)_6^{3+}$). Walsh diagram for H_2O molecule.

UNIT-II: Inorganic Cage and Ring Compounds:

Preparation, structure and reactions of boranes, carboranes, metallo carboranes, boron–nitrogen ($\text{H}_3\text{B}_3\text{N}_3\text{H}_3$), phosphorus–nitrogen ($\text{N}_3\text{P}_3\text{Cl}_6$) and sulphur-nitrogen (S_4N_4 , $(\text{SN})_x$) cyclic compounds. Electron counting in boranes – Wade ‘s rules (Polyhedral skeletal electron pair theory). Isopoly and heteropoly acids.

UNIT-III: Coordination Compounds:

Crystal field theory - crystal field splitting patterns in octahedral, tetrahedral, tetragonal, square planar, square pyramidal and trigonal bipyramidal geometries. Calculation of crystal field stabilization energies. Factors affecting crystal field splitting energies – Spectrochemical series – Jahn – Teller effect, nephelauxetic effect – ligand field theory. Term symbols – Russell – Sander’s coupling – derivation of term symbols for various configurations. Spectroscopic ground states.

UNIT- IV: Electronic Spectra of Transition Metal Complexes:

Selection rules, breakdown of selection rules – Orgel and Tanabe- Sugano diagrams for d^1 – d^9 octahedral and tetrahedral transition metal complexes of 3d series – Calculation of Dq , B and β parameters. Charge transfer spectra. Magnetic properties of transition and inner transition metal complexes – spin and orbital moments – quenching of orbital momentum by crystal fields in complexes.

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. (P) Organic Chemistry Examination Semester: I,
Paper Code:
(w.e.f 2025-26Admitted batch)

Paper- II: INORGANIC CHEMISTRY-I

Blue Print

Sl.No.	Unit No.	Unit name	Essay questions (10M)	Short questions (4M)	Total questions
1	I	Structure & Bonding	2	2	4
2	II	Inorganic cage and ring compounds	2	2	4
3	III	Coordination compounds	2	2	4
4	IV	Electronic spectra of transition metal complexes	2	2	4
Total questions			8	8	16

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. (P) Organic Chemistry Examination Semester: I,
Paper Code:
(w.e.f 2025-26 Admitted batch)

Paper- II: INORGANIC CHEMISTRY-I

Model Question Paper

Time: 3 hours

Maximum Marks: 60M

Section-A

Answer all questions

(4x10=40M)

1. i) Explain Walsh diagram for H₂O molecules.
ii) Applications of VSEPR theory.

OR

2. Draw the MO energy level diagram for [Co (NH₃)₆]³⁺, [CoF₆] and discuss their magnetic properties.
3. Describe the preparation, structure and reactions of Boron-Nitrogen and Sulphur – Nitrogen Cyclic compounds.

OR

4. Write about: i) Homopoly and Heteropoly acids ii) Wades rules
5. Explain the crystal field splitting patterns in tetrahedral and Square planar geometries with suitable examples.

OR

6. Discuss: i) Nephelauxetic effect. ii) Russell- Sanders Coupling.
7. Draw the Orgel diagram for [TiCl₄]⁻ ion and [Fe(CN)₆]³⁻ and explain the electronic transitions.

OR

8. Discuss how Tanabe-Sugano diagrams differ from Orgel diagram? Draw the Tanabe- sugano diagram for [V (H₂O)]³⁺.

Section-B

Answer any five questions.

(5x4=20M)

9. Write the rules of LCAO method.
10. Predict geometries of XeF₄, SF₄ molecules using VSEPR theory.
11. Write the structure and properties of borazole.
12. Discuss the factors affecting Crystal field splitting energy.
13. Describe the structure and properties of metallo carboranes.
14. Write an account of Spin- Orbital Coupling.
15. Discuss the different types of Paramagnetic behaviours.
16. Write a note on charge transfer spectra.

SCIM GOVT COLLEGE (A) TANUKU
M.Sc (Previous), Organic Chemistry Syllabus Semester-I,
Course Code:
(w.e.f 2025-26 Admitted batch)

Paper- III: ORGANIC CHEMISTRY-I

UNIT-I: Nature of bonding inorganic molecules:

15Hrs

Electronic Effects and Reactive intermediates:- Inductive effect, Mesomeric effect (Resonance), Hyper- conjugation, localized and delocalized covalent bonds, delocalized chemical bonding conjugation, cross conjugation, Steric effect, Tautomerism, Generation, structure, stability and reactivity of carbocations, carbanions, free radicals, carbenes, nitrenes and arynes, catalysts – definitions and examples. **Introduction to Acid-Base Concepts: Definitions and basic principles. Acid Dissociation Constant (K_a) and pK_a : Calculation and interpretation. Base Dissociation Constant (K_b) and pK_b : Calculation and interpretation. Factors Influencing Acidity and Basicity: Detailed structural analysis. Use of pK_a Tables: Applying pK_a values to predict reaction direction.**

UNIT-II : AROMATICITY

Criteria of Aromaticity:- Huckel's rule and MO Theory, aromaticity in benzenoid non-benzenoid compounds, Aromaticity in Charged and Fused-Ring Systems, Hetero-aromatic Systems, Annulenes: Cyclobutadiene, Benzene, 1,3,5,7- Cyclooctatetraene, [10] Annulenes- [12], [14], [16] and [18] annulenes, azulenes, fulvenes, fullerenes, ferrocene, non aromaticity, anti- aromaticity and homo- aromaticity.

UNIT-III : Stereochemistry & Molecular representation of organic molecules: 20 Hrs

Molecular Symmetry and Chirality:- Symmetry elements, Definition and classification of Stereoisomers, Enantiomer, Diastereomer, Homomer, Epimer, Anomer, Configuration and Conformation, Configurational nomenclature: D,L and R, S nomenclature, Molecules with a single chiral center: Molecules with two or more chiral centers.

Geometrical Isomerism and Conformations of Cyclic Systems:- Cis-trans, E, Z- and Syn & anti nomenclature, Methods of determining configuration of Geometrical isomers using physical, spectral and chemical methods, Stability, Cis-trans inter conversion. Conformations of cyclobutane, cyclopentane, cyclohexane, mono and disubstituted cyclohexanes.

Prochirality and Prostereoisomerism:- Homotopic ligands and faces; enantiotopic ligands and faces; diastereotopic ligands and faces; nomenclature of enantiotopic ligands and faces (Pro-R, Pro-S, Re, Si carbonyl compounds and Alkenes)

Stereoisomerism in molecules without chiral Center -Axial chirality Allenes, Alkylidene cycloalkanes, spiranes, nomenclature. Atropisomerism: Biphenyl derivatives, nomenclature. Planar chirality: Ansa compounds, paracyclophanes, trans-cyclooctene and Helicity

UNIT–IV Heterocyclic compounds

15 Hrs

Importance of heterocyclic compounds as drugs. Nomenclature of heterocyclic systems based on ring size, number and nature of hetero atoms. Chemistry of heterocyclic compounds, synthesis and reactivity of the following systems: Quinoline, Isoquinoline, Indole, Pyrazole, Imidazole, Oxazole, Isoxazole.

Baldwin ring closure rules, formation of 3,4,5 and 6 membered rings.

Books Suggested:

1. Advanced Organic Chemistry-Reactions, Mechanism and structure, Jerry March, 6th Ed.
2. Organic Chemistry, Paula Yurkanis Bruice, 4th Ed. (Printice Hall)
3. Organic chemistry- Clayden J. N. Greeves, S. Warren,S. 2nd edition (Oxford)
4. Organic Chemistry, Wade, L.G. Jr. 5th Ed. (Pearson)
5. A Guide Book to Mechanism in Organic Chemistry, Peter Sykes, 6th Ed., (Longman).
6. Reaction Mechanism in Organic Chemistry, P.S. Kalsi, 2nd Ed. (New Age International).
7. Stereochemistry to Organic Compounds, D. Nasipuri, 2nd Ed. (New Age International).
8. Stereochemistry, P.S. Kalsi, 5th Ed. (New Age International).

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. Organic Chemistry Examination Semester-I,
Course Code:
(w.e. 2025-26Admitted batch)

Paper- III: ORGANIC CHEMISTRY-I

Blue Print

Sl.No.	Unit No.	Unit name	Essay questions (10M)	Short questions (4M)	Total questions
1	I	Nature of bonding in organic molecules	2	2	4
2	II	Aromaticity	2	2	4
3	III	Stereochemistry	2	2	4
4	IV	Heterocyclic compounds	2	2	4
Total questions			8	8	16

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. Organic Chemistry Examination Semester-I,

Course Code:

(w.e.f. 2025-26 Admitted batch)

Paper-III: Organic chemistry-I

Model Question Paper

SECTION-A

Answer ALL Questions

(4x10=40 Marks)

1. Write about the following (4+4+2)
i) Inductive effect ii) Mesomeric effect iii) Hyperconjugation

OR

2. Write about the generation, stability and reactivity of carbocation, carbanion, carbene?
3. Write about the differences of aromatic, anti aromatic, non-aromatic with examples?

OR

4. Write about the following
I) What are annulenes? Discuss the aromaticity of [10], [14] and [18] annulenes?
II) Explain aromaticity in azulenes and fulvenes

5. Write the CIP rules for R, S nomenclature with at least three examples.

OR

6. I) Explain conformation analysis in mono and disubstituted cyclohexane derivatives

7. Write about the following
i) isoxazole ii) oxazole iii) imidazole

(OR)

8. Write the reaction and mechanism and its applications
i) Fischer indole synthesis ii) Skrap synthesis iii) pyridine

SECTION-B

Answer any FIVE of the following

(5x4=20 Marks)

9. i) What is tautomerism and write the examples
ii) Why carboxylic acids are more acidic than phenols?
10. i) Explain why tropone possess high dipole moment?
ii) Define Anti aromaticity and Homo aromaticity
11. Write about Taft equation and Hammett equation?

12. Write the structure of 14 annulene?
13. Explain structure and stability of carbene and nitrene
14. Write the structures of quinine and atropine
15. Write the electrophilic substitution reaction applications with mechanism for quinoline and isoquinoline.
16. Explain chirality in Allenes, Biphenyls?
Write the structural conformations of cis-1-isopropyl-4-methyl cyclohexane and trans-1-isopropyl-4-methyl cyclohexane. Write the more stable conformation

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. (P) Organic Chemistry Syllabus Semester-I,
Course Code:
w.e.f. 2025-26 Admitted batch

Paper- IV: PHYSICAL CHEMISTRY-I

UNIT-I: Thermodynamics-I: Concepts of partial molar properties – partial molar volume and its significance; Determination of partial molar volume: Graphical method, intercept method and apparent molar volume method. Partial molar free energy, chemical potential, Variation of chemical potential with T and P. Gibbs Duhem equation-derivation and significance. Phase equilibrium-Derivation of phase rule from the concept of chemical potential. Ideal solutions - Thermodynamic properties of ideal solutions mixing quantities; Vapour pressure-Raoult's law; Thermodynamic properties of ideally dilute solutions. Vapour pressure- Henry's law. Non-ideal systems -Concept of fugacity, fugacity coefficient. Determination of fugacity; Non ideal solutions. Activities and activity coefficients; Standard-state conventions for non ideal solutions; Determination of activity coefficients from vapour pressure measurements. Activity coefficients of non-volatile solutes using Gibbs-Duhem equation. Chemical equilibrium- effect of temperature on equilibrium constant-Van'tHoff equation

UNIT-II: Micelles and Macro molecules: Surface Active Agents: Classification of surface active agents - Micellisation - critical Micelle concentration (CMC)- factors affecting the CMC of surfactants, micro emulsions - reverse micelles - Hydrophobic interaction.

Polymer- definition, types of polymers, electrically conducting, fire resistant, liquid crystal polymers, kinetics of free radical polymerization. Molecular mass- Number and mass average molecular weight, molecular weight determination-End group analysis, Osmometry, viscometry, ultracentrifugation and light scattering methods.

UNIT-III: Chemical Kinetics: Theories of reaction rates- Collision theory- Limitations, Transition state theory: Eyring equation, thermodynamic aspects. Primary salt and secondary salt effect, Effect of dielectric constant, effect of substituent, Hammett equation-limitations, Taft equation; Prediction of rate constants- Consecutive reactions, parallel reactions, opposing reactions (Uni molecular steps only, no derivation). Specific and general acid-base catalysis, Skrabal diagram;

UNIT-IV: Photochemistry: Electronic transitions in molecules, Franck-Condon principle. Electronically excited molecules- singlet and triplet states, spin-orbit interaction. Quantum yield and its determination; Actinometry- ferrioxalate and uranyl oxalate actinometers-problems. Derivation of fluorescence and phosphorescence quantum yields. Quenching effect- Stern Volmer equation. Photochemical equilibrium and delayed fluorescence - E type and P type Photochemical primary processes, types of photochemical reactions-photodissociation, Photochemical primary processes, types of photochemical reactions-photodissociation, addition and isomerization reactions with examples.

REFERENCE BOOKS.

1. Physical Chemistry by Peter Atkins and Julio de Paula, Oxford University Press.
2. Physical Chemistry by G.W. Castellon, Narosha Publishing House
3. Physical Chemistry by W.J. Moore, Prentice Hall
4. Thermodynamics for Chemists, Samuel Glasstone
5. Chemical Kinetics by K.J. Laidler, McGraw Hill Pub.
6. Photochemistry, R.P. Kundall and A. Gilbert, Thomson Nelson.
7. Polymer Chemistry by Billmayer
8. Introduction to Polymer Science, V.R. Gowriker, N.V. Viswanadhan and J. Sreedhar., Wiley Easter.

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. (P) Organic Chemistry Syllabus Semester-I,
Course Code:
With effect from 2025-26 Admitted batch

Paper- IV: PHYSICAL CHEMISTRY-I

Blue Print

Sl.no	Unit no.	Unit name	Essay questions (10)	Short questions (4)	Total questions
1	I	Thermodynamics-I:	2	2	4
2	II	Micelles and Macro molecules:	2	2	4
3	III	Chemical Kinetics:	2	2	4
4	IV	Photochemistry:	2	2	4
Total questions			8	8	16

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. (P) Organic Chemistry Syllabus Semester-I,
Course Code:
With effect from 2025-26 Admitted batch
Paper- IV: PHYSICAL CHEMISTRY-I

Model Question Paper

Time: 3 hours

Maximum Marks: 60M

SECTION-A

Answer All Questions

(4X10=40Marks)

- 1.i) Explain partial molar properties and its determination methods.
- ii) Explain chemical potential and derive Gibbs – Duhem equation.
OR
2. Write a short note activity and activity coefficient. Write its determination methods
3. Explain the process of micellization and discuss the factors effecting CMC of Surfactants..
OR
- 4.i) Explain briefly Number average & weight average molecular weight of a polymer.
- ii) Derive an expression to determine the kinetic chain length of the polymer.
5. Write an account on primary and secondary salt effects..
OR
- 6.i) Write a note on Skrabal plots.
- ii) Write a short note on collision theory..
7. Write a note on stern volmer equation.
OR
- 8.i) Discuss fluorescence and delayed fluorescence.
- ii) Explain photo dissociation and photochemical oxidation reactions with examples.

SECTION – B

Answer any FIVE questions

(5x4=20Marks)

9. Write a short note on fugacity and fugacity coefficient.
10. What is vapour pressure? Derive Raoult's law
11. Write the types of polymers?
12. Write the classification of surface active agents.
13. Write a short note on Hammett equation
14. Discuss the kinetics of consecutive reactions.
15. State and explain Frank-Condon principle.
16. Discuss briefly photochemical equilibrium

SCIM GOVT COLLEGE (A) TANUKU
M.Sc (Previous), Organic Chemistry Syllabus Semester: I,
Course Code:
(w.e.f. 2025-26 Admitted batch)

Laboratory work (6 hrs. / Week)

Inorganic chemistry practical's –I

Mixture salt micro analysis: Max marks-100 marks (External – 60M + Internal-40M)

1. Qualitative inorganic analysis of mixture salt containing three anions (One Interfering) and three cations (Less familiar) from the following:

Anions: Carbonate, chloride, bromide, Iodide, nitrate, acetate, borate, phosphate, oxalate, tartrate, chromate and sulphate.

Cations: Lead, silver, mercury, copper, cadmium, molybdenum, iron, aluminium, ceric, zirconium, vanadium, zinc, manganese, nickel, cobalt, calcium, strontium, barium, potassium and ammonium & lithium.

2. Preparation of inorganic compounds:

1. Preparation of tetra ammine copper (II) sulphate.
2. Preparation of Tris (Thiourea) cuprous sulphate.

Scheme of valuation for Qualitative inorganic analysis

Max. Marks: 60

Time: 3 hrs.

Sl.No.	Test	Description	Marks
1.	State		2
2.	Colour		2
3.	Odour		1
4.	Solubility		2
5.	Action of heat		3
6.	Flame test		3
7.	Any two preliminary tests for each anion	For one anion 1+1=2 Three anions 3x2=6	6
8.	Preparation of Sodium carbonate extraction		2
9.	Confirm test for each anion	For one anion : 2 Three anions 3x2=6	6
10.	Elimination of Interfering Anion		2

11.	Cations main group separation Table		1
12.	Correct cation group report	3x1	3
13.	Analysis of individual cation Groups	3x2	6
	Correct Report	For each radical	6
14.	Total for analysis		50
15.	Viva-voice		5
16.	Record		5
17.	Total marks		60

- **If ammonium cation present:**
- **With sodium hydroxide solution test -2marks**
- **Nessler's reagent test -2marks**

SCIM GOVT COLLEGE (A) TANUKU
M.Sc.(P) Organic Chemistry Practical Syllabus Semester: I,
Course Code:
(w.e.f 2025-26 Admitted batch)

Laboratory work (6 hrs./ Week)

Organic Chemistry practical's –I

Preparation, recrystallization, and determination of melting point & yield of the following compounds:

(i) Aspirin, (ii) Nerolin, (iii) Chalcone, (iv) *p*-Nitro acetanilide, (v) 2,4,6- Tribromoaniline, (vi) *m*-Dinitrobenzene, (vii) Phthalimide, (viii) Diels-Alder adduct.

Books Suggested

1. Vogel's Text Book of Quantitative Chemical Analysis, J. Mendham, R. C. Denney, J. D. Barnes and M. J. Thomas, 4th & 6th Ed. (Pearson Education Asia).
2. Vogel's Text Book of Practical Organic Chemistry, B.S. Furniss, A.J. Hannaford, P.W.G. Smith, A.R. Tatchell, 5 Ed. (Longman Scientific & Technical)

Scheme of Valuation

Internal Marks: 40M

External Marks: 60M

Record: 10M

Practical: 50M

SCIM GOVT COLLEGE (A) TANUKU
M.Sc Organic Chemistry Examination Semester-I,
Course Code:
(w.e.f 2025-26Admitted batch)

Paper- IV: PHYSICAL CHEMISTRY PRACTICAL-I

Laboratory work (6 hrs. / Week)

Physical Chemistry practical's –I

1. Determination of critical solution temperature of phenol-water system.
2. Effect of added electrolyte on the CST of phenol-water system.
3. Conductometric titration of Strong acid versus Strong base
4. Dissociation constant of weak acid (CH₃COOH) by conductometric method.
5. Conductometric titration of Weak acid vs Strong base.
6. Determination of cell constant

Scheme of Valuation

Internal Marks: 40M

External Marks: 60M

Record: 10M

Practical: 50M

II SEMESTER

SCIM GOVT COLLEGE (A) TANUKU
M.Sc (P) Organic Chemistry Syllabus Semester-II,
Course Code:
(w.e.f 2025-26Admitted batch)

Paper-I General Chemistry-II

UNIT-I:Basic Quantum Chemistry-II

The concept of tunneling- particle in three - dimensional box Calculations using wave functions of the particle in a box Orthogonality, measurability of energy, position and momentum, average values and probabilities. Hydrogen atom- solution of $R(r)$, $\Phi(\phi)$ and $\Theta(\theta)$ equations. Probability density in orbitals- shapes of orbitals- Perturbation theory- Time independent perturbation theory(only first order perturbation is to be dealt with)- application to ground state energy of Helium atom-

UNIT-II:Basic Quantum Chemistry-III

15 Hrs

Variation principle- applications- calculation of zero-point energy of harmonic oscillator- many electron atom- Hartree-Fock self-consistent field method(qualitative treatment only) ; Pauli exclusion principle; Slater determinants. Molecular structure and Chemical bonding: Born-Oppenheimer approximation; Valence bond theory and linear combination of atomic orbitals – molecular orbital (LCAO-MO) theory. Hybrid orbitals. Applications of LCAO-MO theory to H_2^+ , H_2 ; orbital theory (MOT) of homo- and heteronuclear diatomic molecules. Hückel approximation and its application to annular π – electron systems

UNIT-III

15 Hrs

Treatment of analytical data: Accuracy and precision- Classification of errors-Determinate and Indeterminate errors Minimization of errors- Absolute and Relative errors, propagation of errors- Distribution of Indeterminate errors- Gaussian distribution- Measures of central tendency- Measures of precision- Standard deviation- Standard error of mean-student's test- Confidence interval of mean- Testing for significance- Comparison of two means- F-test- Criteria of rejection of an observation- Significant figures and computation rules.

Phase rule: Clausius- Clapeyron equation. Phase diagram of one component systems: CO_2 , H_2O , S; two component systems: solid-liquid systems.

UNIT-IV

15 Hrs

SOLID STATE STRUCTURE: Order - spatial, orientational; Types of solids; Symmetry in crystals - primitive lattice vector – crystal systems - Bravais lattices - crystallographic point groups and space groups; X-ray diffraction - reciprocal lattice, crystal defects.

SUPRAMOLECULAR CHEMISTRY IN LIFE : Ionophores, Porphyrin and other Tetrapyrrolic Macrocycles, Coenzymes, Neurotransmitters, DNA and Biochemical Self-assembly, Host-guest systems, crowns, cryptands, clathrates and inclusion complexes.

Suggested Books:

1. Introductory Quantum chemistry: by A.K. Chandra
2. Group theory for Chemistry: by A.K. Bhattacharya,
3. Chemical Applications of Group Theory by FA Cotton, 3rd Edition, Wiley Inter science, New York
4. Introductory Group theory for chemists: by George Davidson
5. Vogel 's text book of quantitative analysis: by Vogel
6. Fundamentals of Analytical chemistry: by Skog and West

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. (P) Organic Chemistry Examination Semester-II,
Course Code:
(w.e.f 2025-26 Admitted batch)

Paper-I General Chemistry-II

Blue Print

Sl.No.	Unit No.	Unit name	Essay questions (10M)	Short questions (4M)	Total questions
1	I	Basic Quantum Chemistry-II	2	2	4
2	II	Basic Quantum Chemistry-III	2	2	4
3	III	Treatment Of Analytical Data & Phase rule	2	2	4
4	IV	Solid State Structure & Supramolecular Chemistry In Life	2	2	4
Total questions			8	8	16

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. (P) Organic Chemistry Examination Semester-II,
Course Code:
(w.e.f 2025-26 Admitted batch)
Paper-I General Chemistry-II

Model Question Paper

Time: 3 hours

Maximum: 60M

Section-A

Answer all questions

(4x10=40M)

1. Derive the solution for Schrodinger wave equation for a particle in one dimensional box with constant potential energy.

OR

2. Derive the solution for Schrodinger wave equation for simple harmonic oscillator. Add a note on selection rules.

3. Discuss molecular orbital theory (LCAO –MO) and apply LCAO-MO theory to H_2^+ , H_2

OR

4. Discuss the variation theorem and apply it to calculate the zero point energy of harmonic oscillator

5. Give an account on determinate and indeterminate errors? Give an example for each

OR

6) Explain phase diagram of one component system with example

7) i) Write about the types of crystal systems ?

ii) write a short note on Bragg's equation?

OR

8. Write about the structure of Ionophores, Porphyrin

SECTION – B

Answer any Five question

5X4=20M

9. Write a short note Hartree-Fock self-consistent field method

10. Write a short note on Huckel molecular orbital theory

11. Explain symmetry elements and symmetry operation with suitable examples.

12. Explain point group with suitable example.

13. What is f-test and t-test? How is it useful in chemical analysis?

14. Explain Clausius- Clapeyron equation.

15. Explain about bravias lattice

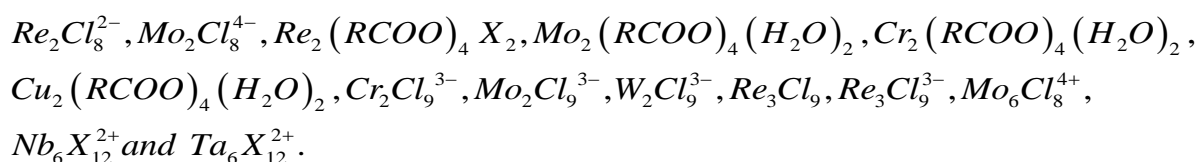
16. Write structures of cryptands, clathrates

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. (P) Organic Chemistry Syllabus Semester-II,
Course Code:
(w.e.f 2025-26 Admitted batch)
Paper-II: Inorganic Chemistry – II

UNIT-I:

15Hrs

Metal cluster compounds - definition – evidences for existence of M-M bonds - conditions favourable for formation of M-M bonds – preparation, structure and bonding of the following metal cluster compounds.



Polyatomic clusters – Zintl ions, Chevrel phases.

UNIT-II

15Hrs

Organometallic compounds - 16 and 18 electron rules. Isoelectronic relationship - Synthesis, structure, bonding and reactions of carbon monoxide, dinitrogen and nitric oxide complexes. Isolobal relationship – H, Cl, CH₃, Mn(CO)₅; S, CH₂, Fe(CO)₄; P, CH, Co(CO)₃. Synthesis, structure, bonding and reactions of metallocenes with special reference to ferrocene. Catalysis by Organometallic compounds – Homogeneous Catalysis – Alkene hydrogenation – Wilkinson 's catalyst, Hydroformylation

UNIT-III:

Metal Ligand equilibria in solution: Stepwise and overall formation constants and their interaction– trends in stepwise constants – factors affecting the stability of metal complexes– Pearson 's theory of hard and soft acids and bases (HSAB), chelate effect and its thermodynamic origin, determination of stability constants of complexes–spectrophotometric method and pH–metric method. Reactivity of metal complexes–inert and labile complexes. Explanation of lability on the basis of VBT & CFT.

Bio-Inorganic Chemistry: Metalloporphyrin with special reference to Hemoglobin & Myoglobin. Biological role of alkali and alkaline earth metal ions with special reference to Ca²⁺. Biological and a biological Nitrogen Fixation

UNIT- IV

15Hrs

Inorganic Reaction Mechanisms: Substitution reactions of metal complexes – D, Id, Ia and A mechanisms – Ligand replacement reactions of octahedral complexes – Acid hydrolysis – factors affecting acid hydrolysis – Anation and Base hydrolysis of Cobalt(III) complexes. Ligand displacement reactions of square planar complexes of platinum (II). Factors affecting

square planar substitution – trans effect (theories).

Electron transfer reactions of complexes – concept of complementary and non-complementary reactions with examples. Inner and outer sphere mechanisms.

Text books:

1. Advanced Inorganic Chemistry by F.A. Cotton and R.G. Wilkinson, IV Edition, John, John Wiley and Sons, New York, 1980.
2. Inorganic Chemistry by J.E. Huheey, III edition, Harper International Edition, 1983.
3. Organometallic Chemistry-A unified approach by A. Singh and R.C. Mehrotra, Wiley Eastern Ltd.
4. Inorganic Chemistry by Shriver and Atkins, Oxford University Press (1999)
5. Theoretical Inorganic Chemistry, II Edition by M.C. Day and J. Selbin, Affiliated East-West press Pvt. Ltd.
6. Mechanisms of Inorganic reactions in solution by D.Benson, MCgraw Hill, London, 1968.
7. Inorganic chemistry by K.F. Purcell and J.C.Kotz, W.B. Saunders company, New York, 1977.
8. Elements of Bioinorganic Chemistry by G.N. Mukherjee and Arabinda Das, U.N. Dhur & sons Pvt. Ltd, Calcutta

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. (P) Organic Chemistry Syllabus Semester-II,
Course Code:
(w.e.f 2025-26Admitted batch)

Paper-II: Inorganic Chemistry – II

Blue Print

Sl.No.	Unit Name	Essay (10M)	Short (4M)	Total questions
1	Unit-I Metal cluster compounds	2	2	4
2	Unit-II Organometallic compounds	2	2	4
3	Unit-III Metal Ligand equilibria in solution & Bio-Inorganic Chemistry	2	2	4
4	Unit-IV Inorganic Reaction Mechanisms	2	2	4
	Total	8	8	16

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. (P) Organic Chemistry Syllabus Semester-II,
Course Code:
(w.e.f 2025-26 Admitted batch)

Paper-II: Inorganic Chemistry – II

Model question paper

Time: 3 hours

Maximum: 60 Marks.

Section-A

Answer all questions

(4x10=40M)

1) Discuss the structure and bonding in $\text{Re}_2\text{Cl}_8^{2-}$ and $\text{Mo}_2\text{Cl}_8^{4-}$

OR

2) What are polyatomic clusters? Write the general methods of preparation of metal cluster compounds by taking suitable examples.

3) Write the synthesis of ferrocene. Discuss the structure and bonding in ferrocene.

OR

4) Discuss the structure, bonding and reactions of nitric oxide.

5) Define stepwise and overall formation constants of metal-ligand complexes with examples.

OR

6) Explain the factors influencing the stability of metal complexes.

7) I) Discuss the biological role of alkali and alkaline earth metals with special reference of Ca^{2+}

II) Explain I_a and I_d inorganic reaction mechanisms with one example each.

OR

8) Explain the base hydrolysis of Cobalt(III) complexes.

Section-B

Answer Any Five questions.

(5X4=20M)

9. Define metal cluster compounds. Write the favourable conditions for the formation of M-M bonds.

10. Give evidence for the existence of M-M bonds.

11. State and explain 16 and 18 electron rules.

12. Explain the isolobal relationship with examples.

13. Explain the Pearson's concept of Hard and Soft acids with one example each.

14. Write a short note on Nitrogen Fixation.

15. Explain the mechanism of Acid Hydrolysis with an example.

16. Explain the outer sphere reaction mechanism of metal complexes by taking one example.

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. (P) Organic Chemistry Syllabus Semester-II,
Course Code:
(w.e.f 2025-26Admitted batch)

Paper-II: Organic Chemistry – II

UNIT-I

Reaction Mechanism 15Hrs

Aliphatic Nucleophilic Substitution and Nucleophilic Aromatic substitution: Stereochemistry of SN2 and SN1 mechanisms, Neighboring Group Participation (Anchimeric assistance), NGP by O, S, N: Aromatic Nucleophilic substitution: SN2 (Ar) (Addition – Elimination), SN1(Ar), Basic mechanistic concepts – kinetic versus thermodynamic control, Hammond's postulate and Curtin-Hammett principle. Methods of determining reaction mechanisms through kinetics, identification of products, intermediates and isotopic labelling. Linear free-energy relationship – Hammett and Taft equations.

Elimination Reactions: Type of elimination reactions, mechanisms, Stereochemistry and Orientation, Hofmann and Saytzeff rules, Syn elimination versus anti-elimination, competition between elimination and substitution, pyrolytic eliminations.

UNIT-II

(A) Addition Reactions

15 Hrs

(B) Addition to Carbon – Carbon Multiple Bonds: Mechanistic and stereochemical aspects of addition reactions involving electrophiles, nucleophiles and free radicals, region and chemo selectivity, orientation and reactivity, Hydrogenation of double and triple bonds, hydrogenation of aromatic rings, Hydroboration.

(C) Addition to Carbon-Hetero Multiple Bonds: Steric course of addition reactions to C=O and C=N, Aldol, Cannizzaro, Perkin, Knoevenagel, Claisen-Schmidt, Claisen, Dieckman, Benzoin and Stobbe condensations, Reformatsky reaction, Tollen's reaction, Prins reaction: Wittig, Grignard, Mannich, and Michael reaction.

UNIT-III

Molecular Rearrangements

15 H

Types of molecular rearrangements, migratory aptitude;

Rearrangements to electron deficient carbon: Pinacol-pinacolone, Wagner-Meerwein, Tiffeneau – Demjanov, Dienone – Phenol, Arndt-Eistert synthesis;

Rearrangements to electron deficient nitrogen: Beckmann, Hofmann, Curtius, Schmidt and Lossen rearrangements;

Rearrangements to electron deficient oxygen: Baeyer-villiger, Hydro peroxide rearrangement and Dakin rearrangements; Neber rearrangement, Benzil-Benzilic acid and Favorskii rearrangements

UNIT-IV

Biomolecules: Structure, properties and reactions of mono- and di-saccharides, physicochemical properties of amino acids, chemical synthesis of peptides, chemical structure determination of peptides and proteins, structural features of proteins, nucleic acids, lipids, steroids, terpenoids, carotenoids, and alkaloids.

Books Suggested:

1. Stereochemistry to Organic Compounds, E.L. Eliel (John Wiley).
2. Stereochemistry to Organic Compounds, D. Nasipuri, 2nd Ed. (New Age International).
3. Stereochemistry, P.S. Kalsi, 5th Ed. (New Age International).
- 4.
5. Advanced Organic Chemistry-Reactions, Mechanism and structure, Jerry March, 6th Ed. (John Wiley & Sons).
6. Modern Organic Reactions, H. O. House (Benjamin)
7. Structure and Mechanism in Organic Chemistry C. K. Ingold (Cornell University Press).
8. Organic Chemistry, Paula Yurkanis Bruice, 4th Ed. (Printice Hall)
9. Organic chemistry-Clayden J. (Oxford)
10. Organic Chemsitry, Wade, L.G. Jr. 5th Ed. (Pearson)
11. Biochemistry by D. Voet & J. G. Voet, 4th Edition (2010) Published by John Wiley (New York).
12. Lehninger's Principles of Biochemistry by D. L Nelson & M. M. Cox, 5th Edition (2008) Published by W. H. Freeman (New York) and CBS Publishers (New Delhi).
13. Biochemistry by J. M. Berg, J. L. Tymoczko & L. Stryer, 5th Edition (2002) Published by W. H. Freeman (New York).

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. (P) Organic Chemistry Syllabus Semester-II,
Course Code:
(w.e.f 2025-26Admitted batch)

Paper-II: Organic Chemistry – II

BLUE PRINT

Sl.No.	Unit No.	Unit name	Essay questions (10M)	Short questions (4M)	Total questions
1	I	Substitutions and elimination reactions	2	2	4
2	II	Addition Reactions	2	2	4
3	III	Molecular Rearrangements	2	2	4
4	IV	Biomolecules	2	2	4
Total questions			8	8	16

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. (P) Organic Chemistry Syllabus Semester-II,
Course Code:
(w.e.f 2025-26 Admitted batch)
Paper-II: Organic Chemistry – II

Model Question paper

SECTION-A

Time 3 hours

Max Marks: 60M

1. Write about the following
 - i) Write the stereochemistry and orientation effect in elimination reactions
 - ii) Pyrolytic eliminations.

(or)
2. i) Write about anchimeric assistance? How do you distinguish phenonium ions from non carbocation? discuss give appropriate examples
ii) Explain factors that influence the nucleophilic substitution reactions
3. Write about the the following
 - i) Discuss the regio, orientation and reactivity in addition reactions
 - ii) Hydroboration

(or)
4. Write about the following
 - i) Michel addition (ii) Perkin reaction.
5. Write about the following
 - i) Pinacole-Pinacolone rearrangement. ii) Bayer-Villiger rearrangement.

(or)
6. Write about the following
 - i) Favorskii rearrangement. ii) Beckmann rearrangement.
7. Determination peptides and proteins?

(or)
8. Write about mono saccharides and di saccharides?

SECTION- B

Answer any FIVE of the following (5x4=20 M)

1. Explain Hofmann and Saytzeff rules with suitable examples.
2. Write suitable examples for dehydration and dehydrohalogenation
3. (i) Explain why cis-2-butene gives (dl) mixture of 2,3-dibromobutane on addition of bromine.
(ii) Addition of HX on alkene is regioselective. Why?
4. Write Prins and Wittig reactions with suitable examples
5. Write reaction and mechanism of Dakin and Neber rearrangement.
6. Write reaction and mechanism of Arndt-Eistert and Benzil-Benzilic rearrangement.
7. Write any 2 protecting groups of carboxylic acids
8. Write briefly about McLafferty rearrangement and Nitrogen rule

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. (P) Organic Chemistry Syllabus Semester-II,
Course Code:

With effect from 2025-26 Admitted batch

Paper- IV: PHYSICAL CHEMISTRY-II

UNIT-I:

15Hrs

Surfaces and Interfaces: Physisorption and chemisorption. Langmuir, Freundlich and Brunauer–Emmett–Teller (BET) isotherms. Surface catalysis: Langmuir-Hinshelwood mechanism. Surface tension.

Electron Spin Resonance: Principle and experimental technique- g-factor, line shapes and line widths- hyperfine interactions- applications of ESR studies.

UNIT -II:

15Hrs

Thermodynamics-II- Brief review on entropy; entropy changes accompanying specific process – expansion, phase transition, heating, measurement of entropy. Nernst heat theorem; Third law of thermodynamics- Determination of the absolute entropy- Apparent exceptions to Third law of thermodynamics.

Statistical Thermodynamics: Objectives of statistical thermodynamics, Concept of distributions, Types of ensembles. Thermodynamic probability, Most probable distribution Law – Partition Function, (Definition and significance): Molar and molecular partitions- translational, rotational, vibrational and electronic partition functions- Relation between thermodynamic functions (E, H, S, G and Cv) and the partition functions

UNIT-III:

15Hrs

Electrochemistry I: Electrochemical cell- Galvanic and electrolytic cell. Concentration cell with and without transference, Effect of complexation on redox potential- ferricyanide/ferrocyanide couple, Iron (III) phenanthroline / Iron (II) phenanthroline couple. Determination of standard potential, solubility product equilibrium constant and activity coefficients from EMF data. Bjerrum theory of ion association (elementary treatment), Concept of activity and activity coefficients in electrolytic solutions. The mean ionic activity coefficient. Debye-Huckel theory of electrolytic solutions. Debye-Huckel limiting law (derivation not required), Calculation of mean ionic activity coefficient; Limitations of Debye-Huckel theory. Effect of dilution on equivalent conductance of electrolytes - Anomalous behavior of strong electrolytes. Debye Huckel-Onsagar equation – verification and limitations, Fuel Cells.

UNIT-IV:

15 Hrs

Electrochemistry II: The electrode-electrolyte interface. The electric double layer. The Helmholtz-Perrin parallel-plate model, the Gouy-Chapman diffuse-charge model and the Stern model. Electrode reactions: Charge transfer reactions at the electrode-electrolyte interface, Exchange current density and over-potential. Derivation of Butler-Volmer equation, High field approximation, Tafel equation, Low field equilibrium, Nernst equation. Voltametry-Concentration polarization, experimental techniques

Books:

1. Text book of Physical Chemistry by Samuel Glasstone, McMillan Pub.
2. Physical Chemistry by W.J. Moore, Prentice Hall
3. Physical Chemistry by G.W. Castellon, Narosha Publishing House
4. Physical Chemistry by Peter Atkins and Julio de Paula, Oxford University Press.
5. Modern Electrochemistry, 2A & 2B, JOM Bockris & A.K.N.Reddy, Plenum publishers

6. Introduction to Electrochemistry, S.Glasstone.
7. Fundamentals of Molecular Spectroscopy, Banwell
8. Spectroscopy by Straw & Walker.
9. Statistical thermodynamics , M.C.Gupta
10. Statistical Thermodynamics, M.Dole

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M.Sc. (P)Organic Chemistry Syllabus Semester-II,
Course Code:
With effect from 2025-26Admitted batch

Paper- IV: PHYSICAL CHEMISTRY-II

Blue Print

Sl.No.	Unit Name	Essay (10M)	Short (4M)	Total questions
1	Unit-I Physical methods of molecular structural elucidation	2	2	4
2	Unit-II Thermodynamics-II	2	2	4
3	Unit-III Electrochemistry I	2	2	4
4	Unit-IV Electrochemistry II	2	2	4
Total number of questions		8	8	16

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. (P) Organic Chemistry Syllabus Semester-II,
Course Code:

With effect from 2025-26 Admitted batch

Paper- IV: PHYSICAL CHEMISTRY-II

Model Question Paper

Time: 3 Hours

Max Marks: 60M

SECTION-A

Answer all question

(4x10=40M)

1. Write about Brunauer–Emmett–Teller (BET) isotherms

(OR)

2. Write the principle of ESR spectroscopy and write a note g-factor

3. Define the third law of thermodynamics and determine the absolute entropy of substances. (OR)

4. Derive the rotational and translational partition molecular function

5. Discuss the emf of the concentration cells with and without transference.

(OR)

6. Define Debye-Hückel theory and write their limitations and write the effect of dilution on equivalent conductance of electrolytes

7. What is meant by electrical double layer and write briefly about The Helmholtz-Perrin parallel-plate model, the Gouy-Chapman diffuse-charge model.

(OR)

8. Derive the Derivation of Butler-Volmer equation

SECTION-B

Answer Any Five questions

(5X4=20marks)

9. Write about Langmuir, Freundlich absorption isotherm?

10. Write about hyperfine interactions?

11. Write briefly about Boltzmann distribution law?

12. Explain the Nernst heat theorem.

13. Explain standard electrode potential.

14. Write about activity and activity coefficient

15. Write a note on Charge transfer reactions at the electrode-electrolyte interface?

16. Write about Nernst equation

SCIM GOVT COLLEGE (A) TANUKU
M.Sc (P) Organic Chemistry Syllabus
Semester-II,
Course Code:
(w.e.f 2025-26Admitted batch)

Paper-II: Inorganic Chemistry practical – II

Laboratory work (6hrs. / Week) Inorganic Chemistry Practicals – II Quantitative analysis:
Volumetric:

1. Determination of Ferric iron by photochemical reduction
2. Determination of Nickel by EDTA
3. Determination of Calcium and Magnesium in a mixture by EDTA
4. Determination of Ferrocyanide by Ceric sulphate
5. Determination of Copper (II) in presence of iron(III)

Gravimetric:

6. Determination of Zinc as Zinc pyrophosphate
7. Determination of Nickel from a mixture of Copper and Nickel.

Scheme of valuation for Qualitative Inorganic Analysis

Max Marks-100 Marks

(External – 60M + Internal-40M)

Max. Marks: 60M

Time: 3 hrs.

Sl.No.	Item	Marks
1.	Writing description for first 15 minutes	5
2.	Preparation of standard solution.	20
3.	Correct tables & formulas	15
4.	Result: < 2%	20
5.	Viva-voice	5
6.	Record	10
	Total	75
	Result: 2- 5%	20
	Result: 5 - 10%	15
	Result: 10% <	10

SCIM GOVT COLLEGE (A) TANUKU
M.Sc (P) Organic Chemistry Syllabus
Semester-II,
Course Code:
(w.e.f 2024-25Admitted batch)

Paper-III: Organic Chemistry – II
ORGANIC CHEMISTRY PRACTICALS –II

Systematic qualitative analysis of an organic mixture containing two compounds

Identification of method of separation and the functional group(s) present in each of them and preparation of one solid derivative for the confirmation of each of the functional

Books Suggested

1. Vogel's Text Book of Quantitative Chemical Analysis, J. Mendham, R. C. Denney, J. D. Barnes and M. J. Thomas, 4th & 6th Ed. (Pearson Education Asia).
2. Vogel's Text Book of Practical Organic Chemistry, B.S. Furniss, A.J. Hannaford, P.W.G. Smith, A.R. Tatchell, 5 Ed. (Longman Scientific & Technical)

Scheme Of Valuation

Internal Marks: 40M

External Marks : 60M (Practical-50M, Record-10M)

SCIM GOVT COLLEGE (A) TANUKU
M.Sc (P) Organic Chemistry Syllabus Semester-II,
Course Code:
(w.e.f 2024-25Admitted batch)

Paper-IV: PHYSICAL Chemistry practical– II

Laboratory work (6 hrs. / Week)

Physical Chemistry Practicals –II

1. Distribution of iodine between CHCl_3 and water
2. Distribution of I_2 between CHCl_3 and aq.KI solution- calculation of equilibrium constant.
3. Titration of mixture Strong acid and weak acid versus Strong base by conductometry.
4. Titration of Strong acid Vs Strong Base – pH – metry.
5. Titration of mixture of ($\text{NaHCO}_3 + \text{Na}_2\text{CO}_3$) Vs HCl – pH- metry.
6. Titration of Fe^{+2} Vs $\text{K}_2\text{Cr}_2\text{O}_7$ – potentiometry

Scheme of Valuation

Internal Marks: 40M

External Marks : 60M (Practical-50M, Record-10M)

III SEMESTER

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. (F) Organic Chemistry Syllabus Semester-III,
Course Code:

Paper – I: Organic Reaction Mechanisms & Pericyclic Reactions
(w.e.f 2025-26 Admitted batch)

UNIT – I Aliphatic Nucleophilic & Electrophilic Substitution Reactions

A) Aliphatic Nucleophilic Substitution: 15 Hrs

Neighboring group participation by Bromine, Phenyl group, Non-Classical carbocations, NGP by Pi bond, Sigma bond and Cyclopropyl group, Hydrolysis of esters (B_{AC}^1 , A_{C2} , $A_{AC}1$, $A_{AL}1$, $B_{AL}1$), Mechanism of esterification of carboxylic acid with an alcohol using DCC, Mayers Synthesis of aldehydes, ketones and carboxylic acids Mitsunobu reaction, Von-Braun reaction

B) Aliphatic Electrophilic Substitution:

Mechanisms of S_E^1 , S_E^2 , S_{Ei} , Hydrogen as electrophile: Hydrogen exchange; Migration of double bonds, *Halogen electrophiles*. Mechanism of Halogenation of aldehydes and ketones; HVZ reaction; Halogenation of Sulphoxides & Sulphones, *Nitrogen Electrophiles*: Aliphatic diazo coupling, Diazo transfer reaction, Insertion of nitrenes, Metal Electrophiles: Metallation with Organometallic Compounds (Orthometallation), Carbon as Leaving groups: Decarboxylation of Aliphatic Acids; Haller-Bauer reaction.

UNIT – II

15 Hrs

Free Radical Reactions:

Free radical substitution mechanisms; Mechanism at an aromatic substrate; Neighboring group assistance in free radical reactions; Reactivity for aliphatic substrates; Reactivity in aromatic substrates; Reactivity at bridge head; Reactivity in the attacking radical; Effect of solvent on reactivity, Allylic halogenations using NBS (Wohl – Ziegler bromination); Hydroxylation at aromatic carbon by Fentons reagent; Oxidation of aldehydes to carboxylic acids; Formation of cyclic ethers using Lead tetraacetate; Formation of hydroperoxides (autooxidation); Coupling of alkynes (Eglinton reaction and Glacer reaction); Arylation of Aromatic compounds by diazoium salts (Gomberg – Bachman reaction); Mechanisms of Sandmeyer reaction, Kolbes reaction, Hunsdiecker reaction, Reed reaction;

UNIT – III

15 Hrs

Pericyclic Reactions-I Molecular orbital symmetry, frontier orbitals of ethylene, 1,3 Butadiene, 1,3,5-Hexatriene, allyl system, classification of pericyclic reactions FMO approach, Woodward- Hoffman correlation diagram method and perturbation of molecular (PMO) approach for the explanation of pericyclic reactions under thermal and photochemical conditions.

Electrocyclic Reactions: Conrotatory and disrotatory motions ($4n$) and ($4n+2$), allyl systems
Cycloadditions: Antarafacial and suprafacial additions, notation. of cycloadditions, ($4n$) and ($4n+2$) systems with a greater emphasis on ($2+2$) and ($4+4$) - cycloadditions, ($2+2$) - additions of ketenes and chelotropic reactions.

UNIT-IV: Pericyclic Reactions-II

FMO approach and perturbation of molecular (PMO) approach for the explanation of sigma tropic rearrangements under thermal and photochemical conditions, suprafacial and antarafacial shifts of H
Sigmatropic shift involving carbon moieties, retention and

inversion of configurations, (3, 3) and (5, 5) sigmatropic rearrangements detailed treatment of Claisen and Cope rearrangements, fluxional tautomerism, aza-Cope rearrangement and Barton reaction.

Text Books and Reference Books:

- 1) Advanced Organic Chemistry: Reactions Mechanisms and Structure by Jerry March, Mc.Graw Hill and Kogakush.
- 2) Molecular reactions and Photochemistry by Charles Dupey and O. Chapman, Prentice Hall.
- 3) Pericyclic reactions by S.N. Mukharji, Mcmilan.
- 4) Mechanisms and Theory in Organic Chemistry by T.H. Lowery and K.S. Rich gardson.
- 5) The modern structural theory in Organic Chemistry by L.N.Ferguson, Pretice Hall
- 6) Physical Organic Chemistry by jack Hine, Mc. Graw Hill
- 7) Advanced Organic Synthesis, Part B-Reactions and Synthesis, Francis A. Carey and Richard J. Sudenburg, Fourth edition, Kluwer academic publishers, New York
- 8) Organic Synthesis, Christine Willis and Martin Willis, Oxford Chemistry primers.
- 9) Principles of Organic Synthesis, ROC Norman and JM Coxon, third edition, CBS, Publisher, Delhi.
- 10) Organic Synthesis, M. B. Smith, Mc Graw Hill, International Edition.

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. (F) Organic Chemistry Examination
Semester-III,
Course Code:
Paper-I: Organic Reaction Mechanisms & Pericyclic Reactions
(w.e.f 2025-26Admitted batch)

Blue Print

Sl.No.	Unit No.	Unit name	Essay questions (10M)	Short questions (4M)	Total questions
1	I	Aliphatic Nucleophilic & Electrophilic Substitution Reactions	2	2	4
2	II	Principles of asymmetric synthesis	2	2	4
3	III	Pericyclic Reactions-I	2	2	4
4	IV	Pericyclic Reactions-II	2	2	4
Total questions			8	8	16

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. (F) Organic Chemistry Examination
Semester-III, Course Code:
Paper-I: Organic Reaction Mechanisms & Pericyclic Reactions
(w.e.f 2025-26 Admitted batch)
Model Question Paper

Time 3 hours

Max Marks: 60M

Section-A

Answer **ALL** Questions.

(4x10=40 Marks)

1. Write a short note on the following.
- i) Neighbouring group participation (NGP) by bromine and phenyl groups. (5 M)
 - ii) Mitsunobu reaction. (5 M)

Or

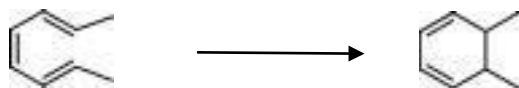
2. Write a short note on the following.
- i) Mechanisms of S_E^1 , S_E^2 , S_{Ei} (5 M)
 - ii) Aliphatic diazo coupling (5 M)
3. Write about the following
- i. Neighboring group assistance in free radical reactions
 - ii. Wittig Rearrangement

(OR)

4. Write about the following
- iii. Sandmeyer reaction
 - iv. Stevens Rearrangement
5. i) Discuss the 1,3,5-hexatriene system by using Woodward Hoffmann correlation method (5M)
- ii) Explain the terms DIS rotation and CON rotation with reference to electrocyclic reactions (5 M)

Or

6. Discuss 1,3,5-hexatriene systems by using Woodward Hoffman and correlation method. (10 M)
7. i) Construct a correlation diagram for the conversion of



(5M)

- ii) What is Cope rearrangement? Explain its mechanism. How is Claisen rearrangement related to Cope rearrangement? (5M)

Or

8. i) Write briefly about (3, 3) and (5, 5) sigmatropic rearrangements (5 M)
- ii) Write a short note on Barton reaction. (5 M)

SECTION-B

Answer Any Five Questions

(5 X 4 = 20 M)

9. Write about hydrolysis of esters
10. Write about aliphatic diazo coupling.
11. Write about chiral NMR
12. Write about enantiomeric excess and specific rotation.
13. Write about classification of pericyclic reactions with suitable examples
14. Write about chelotropic reactions
15. What is Aza Cope rearrangement
16. Write about Fluxional tautomerism

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. (Final) Organic Chemistry Syllabus Semester-III,
Course Code:
Paper – II- ORGANIC SPECTROSCOPY-I

(w.e.f 2025-26 Admitted batch)

UNIT-I: Electronic & IR Spectroscopy

15Hrs

A) Energy transitions—Simple chromophores- Auxochrome, Absorption shifts (Bathochromic, Hypsochromic, Hyperchromic and Hypochromic shifts) UV absorption of Alkenes-Polyenes unsaturated cyclic systems. UV absorption of carbonyl compounds: α,β -unsaturated carbonyl systems- UV absorption of aromatic systems-solvent effects- geometrical isomerism-acid and base effects-typical examples-calculation of λ_{\max} values using Woodward Fieser rules, applications

B) **IR Spectroscopy:** Fundamental modes of vibrations-stretching and bending vibrations—Factors effecting Vibrational frequency-hydrogen bonding. Finger print region and its importance, Organic functional group identification through IR spectroscopy.

UNIT-II: Nuclear Magnetic Resonance Spectroscopy (^1H & ^{13}C NMR) 20 hrs

A) **Introduction:** Basic principle of- NMR Nuclear spin- nuclear resonance, Zeeman splitting-saturation- Relaxation-Instrumentation (CW&FT).

B) Shielding and deshielding of magnetic nuclei-chemical shift and its measurements, factors influencing chemical shift – spin-spin interactions- factors influencing coupling constant J

C) Chemical and Magnetic Equivalence, Chemical exchange, Solvent effects, First and second order spectra and examples of AB, AX and ABX systems. Simplification of complex spectra (second order spectrum): a) Selective spin decoupling: Nuclear Magnetic double resonance, b) Lanthanide shift reagents, c) Spectra at higher fields.

D) ^{13}C NMR: introduction to FT technique, relaxation phenomena, ^1H and ^{13}C chemical shifts to structure correlations.

UNIT-III: Mass spectrometry

15Hrs

A) Basic principles, Instrumentation, ionization techniques- EI, CI, ESI, MALDI and FAB; Mass analyzers – sectors, quadrupole, TOF, ion trap; Detectors – electron multiplier, Faraday cup, array detectors; factors affecting fragmentation, and isotope abundance.

B) Mass spectral fragmentation of organic compounds, High resolution mass spectrometry.

UNIT-IV

10 Hrs

Structure elucidation problems using the above spectroscopic techniques.

Reference Books:

1. R. M. Silverstein, F. X. Webster, D. J. Kiemle, Spectrometric identification of organic compounds, 8th edition, John Wiley, 2023.
2. D. L. Pavia and G. M. Lampman Introduction to Spectroscopy 5th Edition, Cengage Learning, 2015.
3. D. H. Williams and I. Fleming, Spectroscopic Methods in Organic Chemistry, McGraw Hill, 6th edition 2007.
4. H. Gunther, NMR Spectroscopy, 3rd edition, Wiley-VCH, 2013.
5. J. H. Simpson, Organic Structure Determination Using 2-D NMR Spectroscopy, Academic Press, 2008.
6. J. B. Lambert, E.P. Mazzola, Nuclear Magnetic Resonance Spectroscopy, Pearson Education. 4. Organic Spectroscopy, W. Kemp, 3rd edition, Macmillan, 2011.

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. (Final) Organic Chemistry Examination
Semester-III, Course Code:
Paper – II- ORGANIC SPECTROSCOPY-I
(w.e.f 2025-26 Admitted batch)

Blue Print

Sl.No.	Unit No.	Unit name	Essay questions (10M)	Short questions (4M)	Total questions
1	I	Electronic & IR Spectroscopy	2	2	4
2	II	Nuclear Magnetic Resonance Spectroscopy (¹ H & ¹³ C NMR)	2	4	6
3	III	Mass Spectrometry	2	2	4
4	IV	Spectral problems	2	0	2
Total questions			8	8	16

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. (Final) Organic Chemistry Examination
Semester-III, Course Code:
Paper – II- ORGANIC SPECTROSCOPY-I
(w.e.f 2025-26 Admitted batch)

Model Question Paper

Time: 3Hr

Max Marks=60 M

SECTION A

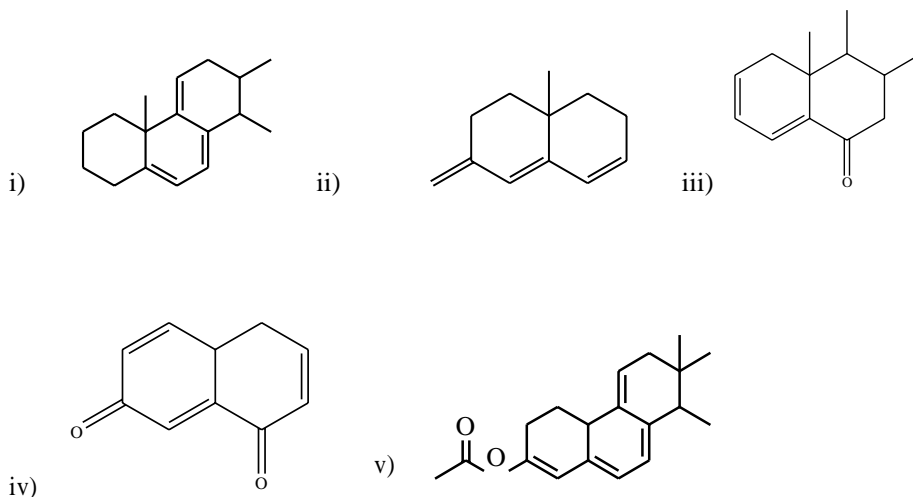
Answer All Questions.

4 x 10 = 40 M

1. Write about the influence of Electronic effects and H-bonding in vibrational frequencies of IR

OR

2. Calculate the λ_{\max} of the following compounds.



3. i) First and Non-First order spectra?

ii) Explain AB, AX and ABX systems with examples

OR

4. Write a detail note on coupling constant J and factors effecting it.

5. Write a note on i) basic principle of mass spectrometry ii) Nitrogen Rule iii) McLafferty rearrangements.

OR

6. Give mass spectral fragmentation of the following compounds

i) Cyclohexanone ii) Toluene iii) Phenol iv) Aniline v) Ethyl phenyl ketone.

7. Deduce the structure of the compound with the spectral data IR(cm^{-1}): 1745 (s), 1225 (br, s), 749 (s), 697 (s) UV (λ_{\max}): 268, 264, 262, 257 nm.

$^1\text{H NMR}$: \square 1.96 (3H, s), 5.00 (2H, s), 7.22 (5H, s)

(OR)

8. Deduce the structure of the compound $C_{10}H_{13}NO_2$ with the spectral data IR (cm^{-1}): 3250, 1650, 1275, 1050.

UV (λ_{max}): 268, 264, 262, 257 nm.

1H NMR (δ ppm): 1.4 (t, 3H), 2.05 (s, 3H), 3.9 (q, 2H), 6.7 (d, 2H, $J=8Hz$), 7.4 (d, 2H, $J=8Hz$).

Section B

Answer any **Five** questions.

(5 x 4 = 20 M)

1. Explain Red shift and Blue shift with examples.
2. Explain vibrational frequencies of different carbonyl compounds with examples.
3. Write about FT NMR instrument and its advantages.
4. Write a note on Chemical exchange.
5. What are the common fragmentation patterns in Mass spectrometry.
6. What is base peak. Give two examples
7. The compound with MF $C_5H_9NO_4$ has the 1H NMR data (δ ppm): 1.25 (t, 3H), 1.76 (d, 3H), 4.26 (q, 2H), 5.24 (q, 1H). Their IR spectrum shows strong bands at 1750 cm^{-1} and 1562 cm^{-1} and a medium intensity band at 1320 cm^{-1} . The normal C-13 and DEPT experimental results are given below. Draw the structure of the compound.

a. Normal Carbon	DEPT-135	DEPT-90
b. 14 ppm	Positive	No peak
c. 16	Positive	No peak
d. 63	Negative	No peak
e. 83	Positive	Positive
f. 165	No peak	Nopeak

8.A neutral compound of MF $C_{10}H_{12}O$ gave the following ^{13}C NMR signals (δ ppm): 22 (q), 68 (d), 128 (d), 129(d), 131 (s), 132 (d) and 166 (s) with relative intensities 8:3:6:8:1:3:1. Deduce its structure.

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. (Final) Organic Chemistry Syllabus Semester-III,
Course Code:
Paper – III- Modern Organic Synthesis-I
(w.e.f. 2025-26 Admitted batch)

Time: 3 Hrs

Max Marks: 60 M

UNIT –I: Formation of C-C single bonds

15 Hrs

Formation of C-C single bonds Alkylations via enolate, Thermodynamic and kinetic enolate, Asymmetric Aldol reaction: a) Chiral enolate and achiral aldehyde b) Achiral enolate and chiral aldehyde - explanation by Zimmerman Traxler model; Stork enamine reaction and its synthetic applications; Organo sulphur chemistry: Umpolung and its synthetic applications (Corey Seebach Reaction), sulphur ylides: dimethylsulphoniummethylide, dimethyloxosulphoniummethylide preparations and their synthetic applications; Organo copper chemistry: Gilman's reagent and synthetic applications;

Organo Palladium Chemistry: Heck Reaction, Stille coupling, Suzuki coupling, Sonogashira coupling, Negishi coupling, Wacker Oxidation, Tsuji Trost C-C bond formations;

Baylis Hilman reaction.

UNIT-II: Formation of Carbon-Carbon double bonds

15Hrs

Stereochemistry of E1 and E2 reactions (Different examples of acyclic and cyclic molecules, Saytzeff rule, Hofmann rules and Bredt's rule); Pyrolytic Syn eliminations (focus should be given on stereochemistry of syn eliminations of amine oxides, xanthates and esters of acyclic and cyclic molecules); Sulphoxide-Sulphenate rearrangement (Mislow-Evans rearrangement); Wittig reaction, Wadsworth Emmons reaction, Corey-Fuchs reaction, Aza wittig reaction, Wittig-Horner reaction and stereo chemistry of Wittig reaction; Shapiro reaction, Eschen-Moser Tanabe fragmentation, Claisen rearrangement of allyl vinyl ethers, Julia Lythgoe olefination, Mc Murray coupling, Peterson Olefination, Tebbs reagent and its application, Metathesis: Grubbs 1st and 2nd generation catalyst, Olefin cross coupling (OCM), ring closing (RCM) and ring opening (ROM) metathesis, applications, olefination Nysted reagent.

UNIT – III Actions of unactivated C-H bonds and organoboranes.

15Hrs

The Hoffmann Loeffler- Freytag reaction, the Barton reaction and Photolysis of organic hypothalites;

Organoboranes: Preparation of Organoboranes viz hydroboration with BH_3 -THF, dicyclohexyl borane, 9-BBN monoisopin camphyl borane (IPCBH_2) and diisopin camphenyl borane

(IPC₂BH) functional group transformations of Organo boranes-Oxidation, protonolysis and isomerisation. Formation of carbon-carbon-bonds viz organo boranes carbonylation and cyanidation, reactions of alkenyl boranes and trialkyl alkynyl borates.

UNIT-IV

15 Hrs

Protecting groups and simple applications of microwave and ultrasound assisted reactions

A. Protecting Groups

1) Protection of **alcohols** as **ethers** [methyl ether (RO-Me), Tertiary butyl ether (ROCM₃), Benzyl ethers (RO-Bn), p-methoxy benzylethers (RO-PMB)], as **Silyl ethers** [Trimethyl silyl ether (R-OTMS), tri ethyl silyl ethers (RO-TES), t-butyl dimethyl silyl ether (R-OTBDMS in the presence of imidazole), tri isopropyl silyl ether (RO-TIPS), t-butyl diphenyl silyl ether (RO-TBDPS)], as **acetals** [tetra hydro pyranyl ethers (RO-THP), methoxy methyl ethers (RO-CH₂-OCH₃ = RO-MOM) and **ester formation** (carboxylic acid ester and *p*-toluene sulphonate esters).

2) Protection of 1,2-diols by acetal, ketal and carbonate formation.

3) Protection of amines by acetylation, benzoylation, benzoyloxy carbonyl, Fmoc and triphenyl methyl groups.

4) Protection of carbonyl by acetal, ketal and thio acetal (Umpolung) groups.

5) Protection of carboxylic acids by esters and ortho ester formation.

Textbooks and Books for Reference:

1. Some Modern Methods of Organic Synthesis W. Carruthers, Fourth Edition, Cambridge University Press, Cambridge, 1988.
2. Modern Organic Synthesis-an introduction by George S.Zweifel and Michael H. Nantz, W. H. Freeman & company, New York.
3. Advanced Organic Synthesis, Part B-Reactions and Synthesis, Francis A. Carey and Richard J. Sudenburg, Fourth edition, Kluwer academic publishers, New York
4. Organic Synthesis, Christine Willis and Martin Willis, Oxford Chemistry primers.
5. Principles of Organic Synthesis, ROC Norman and JM Coxon, third edition, CBS, Publisher, Delhi.
6. Organic Synthesis, M. B. Smith, McGraw Hill, International Edition.
7. Organic Chemistry, Clayden, Greeves and Stewart Warren.
8. Guide Book to Organic Synthesis (3rd edition), R. Mackie, D. M. Smith and Aitken.
9. Organo Boranes and Silanes, Thomson, Oxford Chemistry primers

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. (Final) Organic Chemistry Syllabus Semester-III,
Course Code:
Paper – III- Modern Organic Synthesis-I
(w.e.f. 2025-26 Admitted batch)

Blue Print

Sl.No.	Unit No.	Unit name	Essay questions (10M)	Short questions (4M)	Total questions
1	I	Formation of C-C single bonds	2	2	4
2	II	Formation of Carbon-Carbon double bonds	2	2	4
3	III	Actions of unactivated C-H bonds and organoboranes	2	2	4
4	IV	Protecting groups and simple applications of microwave and ultrasound assisted reactions	2	2	4
Total questions			8	8	16

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. (Final) Organic Chemistry Syllabus Semester-III,
Course Code:
Paper – III- Modern Organic Synthesis-I
(w.e.f. 2025-26 Admitted batch)

Model Question Paper

Time: 3 Hrs

Max Marks: 60 Marks

Section-A

Answer **All** questions

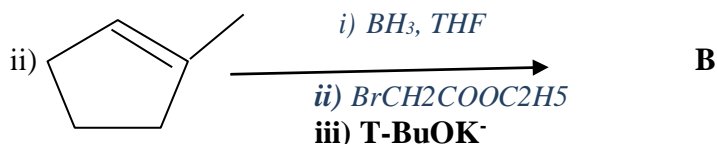
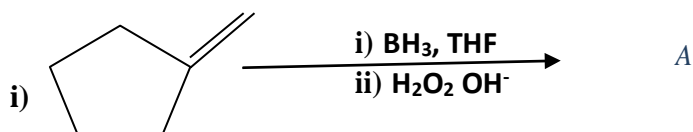
(4x10=40 Marks)

1. Discuss the synthetic applications of
i) Gilman's Reagent ii) Umpolung

Or
2. Write a short note on the following.
i) Baylis-Hillman reaction ii) Synthetic applications of carbenoids.
3. Write a short note on the following
i) Bredt's rule ii) Wittig reaction and Wittig-Horner reaction

Or
4. Write a short note about the following
i) McMurry coupling
ii) Olefin cross-coupling metathesis and ring-opening metathesis
5. Write a short note on the following
i) HLF reaction ii) Barton reaction

Or
6. Predict the products and explain the mechanism for the following reactions. (10 M)



7. Write the protection and deprotection of the following
i) Carbonyl compounds ii) Carboxylic acids

(OR)

8. Write the protection and deprotection of the following
i) Alcohols ii) Amines

Section-B

Answer any Five Questions

5x4=20 M

9. Write about Sulphur ylides
10. Write the formation of enolates and enamines.
11. What is Hoffmann rule.
12. Write about the Olefination by Nysted reagent.
13. Write about the stereochemistry of the hydroboration
14. Write about the protonolysis of organoboranes.
15. What is Fries rearrangement?
16. Write about Fmoc?

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. (Final) Organic Chemistry Semester-III,
Course Code:
(w.e.f 2025-26 Admitted batch)

Paper - IV-: Chemistry of Natural Products

UNIT-I: Alkaloids 15 Hrs

Definition, classification – general chemical methods used in the structure elucidation of alkaloids – Isolation, structure determination, and synthesis of morphine, quinine, papaverine, reserpine and nicotine

UNIT-II: Terpenoids 15 Hrs

Definition, classification based on isoprene unit, isoprene rule, and special isoprene rule. Isolation, structure elucidation and synthesis of citral, α -terpeniol, camphor and α -pinene, Forskolin.

.UNIT-III: Steroids 15 Hrs

Occurrence, nomenclature, basic skeleton, Diel's hydrocarbon and its stereochemistry. Isolation, structure determination and synthesis of cholesterol (total synthesis not expected), androsterone, testosterone, esterone and progesterone.

UNIT-IV: Medicinal Chemistry **15 Hrs**

Concept and definition of Pharmacophore. Pharmacodynamics and Pharmacokinetics.

Classification, SAR, Mechanism of action and Synthesis of drugs for following classes:

A) Antibacterials: sulfonamides and penicillins

B) Antimalerials: Chloroquine

C) NSAIDs: Paracetamol

D) Antidiabetics: Metformin

Books Suggested:

1. Natural Products: Chemistry and Biological Significance, J. Mann, R.S.Davidson, J. B. Hobbs, D. V. Banthrope and J. B. Hatrbnome, Longman, Essex.
2. K. C. Nicolaou, Classics in Total Synthesis, Vol 1, 2 and 3. 2. J. H. Fuhrhop, G. Li, Organic Synthesis: Concepts and Methods, 3rd edition, VCH, 1994.
3. J. Mann, Chemical Aspects of Biosynthesis, Oxford University Press, 1994.
4. R. B. Silverman, The Organic Chemistry of Drug Design and Action, 2nd edition, Elsevier, New York, 2004.
5. G. L. Patrick, An Introduction to Medicinal Chemistry-5, Oxford University Press, 2013.
6. Chemistry of Natural products P. S. Kalsi, Kalyani Publishers
7. Biosynthesis of steroids, terpenes and acetogenins, J. H. Richards & J. R. Hendrieson
8. Medicinal chemistry-Burgers (Vol: I-VI)
9. Principles of medicinal chemistry-William O Foye 3) Comprehensive medicinal chemistry-Corwin and Hansch

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. (Final) Organic Chemistry Semester-III,
Course Code:
(w.e.f 2025-26Admitted batch)

Paper - IV-: Chemistry of Natural Products

Blue Print

Sl.No.	Unit No.	Unit name	Essay questions (10M)	Short questions (4M)	Total questions
1	I	Alkaloids	2	2	4
2	II	Terpenoids	2	2	4
3	III	Steroids	2	2	4
4	IV	Medicinal chemistry	2	2	4
Total questions			8	8	16

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. (Final) Organic Chemistry Semester-III,
Course Code:
(w.e.f 2025-26 Admitted batch)

Paper - IV-: Chemistry of Natural Products

MODEL QUESTION PAPER

TIME: 3hrs

Maximum marks: 60M

SECTION – A

Answer ALL questions. Each question carries 10 marks.

(4x10=40M)

1. Write the structural elucidation of Quinine?
(Or)
2. Write the synthesis of Morphine?
3. Write the structural elucidation of Camphor?
(OR)
4. Write the synthesis of α -terpinol?
5. Write the structural elucidation of Progesterone?
(OR)
6. Write the synthesis of cholesterol?
7. Write the Pharmacophore. Pharmacodynamics and Pharmacokinetics of paracetamol?
(OR)
8. Write the Pharmacophore. Pharmacodynamics and Pharmacokinetics. of chloroquine.

SECTION –B

Answer Any Five Questions

(5x4=20M)

9. Write about isolation of alkaloids?
10. Write the structure determination nicotine and papaverine?
11. What is isoprene rule and classify the terpenoids?
12. Write the structure and synthesis of citral?
13. Write about basic skeleton deals hydrocarbon?
14. Write about biosynthesis of steroids?
15. Write short note on sulfonamides?
16. Write a short note on metformin?

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. (Final) Organic Chemistry Syllabus
Semester-III, Practical Code:
Laboratory Course - 1
(w.e.f 2025-26 Admitted batch)

Organic Chemistry Practical Syllabus

Multistep Synthesis of Organic Compounds:

100M

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

1. Beckmann rearrangement: Benzanilide from Benzophenone Benzophenone - Benzophenone oxime - Benzanilide
2. Benzilic acid rearrangement: Benzilic acid from benzoin Benzoin -Benzil - Benzilic acid
3. Preparation Of Benzopinacolone From Benzophenone

Synthesis Of Heterocyclic Compounds

- 1) Preparation Of Quinoline From Aniline (Skraup synthesis)
- 2) Preparation Of 2-Phenyl Indole From Phenylhydrazine (Fischer indole synthesis)

SCHEME OF VALUATION

Time: 3 Hours

Total: 100 marks

Internal: 40M

External: 60M (Practical 50M , Record 10 M)

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. (Final) Organic Chemistry Syllabus
Semester-III,
practical Code:
Laboratory Course-2

Chromatographic Separation and Isolation & identification of Natural Products

1. Thin layer chromatography: Determination of purity of a given sample, monitoring the progress of chemical reactions, identification of unknown organic compounds by comparing the R_f values of known standards.

2. Isolation and identification of Natural Products

- (a) Isolation of caffeine from tea leaves
- (b) Isolation of eugenol from cloves
- (c) Isolation of casein and lactose from milk
- (d) Isolation of limonene from lemon peel
- (e) Isolation of piperines from black pepper
- (f) Isolation of lycopene from tomatoes
- (g) Isolation of β-carotene from carrots

Books Suggested:

- 1. Ikan, R. Natural Products, A Laboratory Guide, 2nd ed.; Academic Press: New York, 1991.
- 2. Adapted from Introduction to Organic Laboratory Techniques: A Microscale Approach. Pavia, Lampman, Kriz and Engel. (1999) Saunders College Publishing.
- 3. Pharmaceutical drug analysis by Ashutoshkar
- 4. Quantitative analysis of drugs in pharmaceutical formulations by P D Sethi
- 5. Practical pharmaceutical chemistry part-1 and part-2 by A H Beckett and J B Stenlake
- 6. Practical organic chemistry by Mann & Saunders

Text book of practical organic
chemistry including qualitative
organic analysis by A.I. Vogel
(Longman)

SCHEME OF VALUATION

Time: 3 Hours

Total: 100 marks

Internal: 40M

External: 60M(Practical 50M , Record 10 M)

IV SEMESTER

SCIM GOVT COLLEGE (A) TANUKU
M.Sc (Final) Organic Chemistry Syllabus Semester-IV,
Course Code:
Paper – I- Assymmetric Synthesis and Organic Photochemistry
(w.e.f. 2025-26 Admitted batch)

UNIT – I

15 Hrs

Principles of Asymmetric Synthesis: Introduction and terminology: Topicity in molecules Homotopic, stereoheterotopic (enantiotopic and diastereotopic) groups and faces, symmetry, substitution and addition criteria. Prochirality nomenclature: Pro-R, Pro-S, Re and Si. Stereoselective reactions: Substrate stereoselectivity, product stereoselectivity, enantioselectivity and diastereoselectivity. Conditions for stereoselectivity: Symmetry and transition state criteria, kinetic and thermodynamic control. Methods for inducing enantio and diastereoselectivity. Analytical methods: % Enantiomeric excess, enantiomeric ratio, optical purity, % diastereomeric excess and diastereomeric ratio. Techniques for determination of enantiomeric excess, specific rotation, Chiral NMR; Chiral derivatizing agents, Chiral solvent, Chiral shift reagents and Chiral HPLC.

UNIT – II

15 Hrs

Methodologies in asymmetric synthesis

Strategies in Asymmetric Synthesis: 1. Chiral substrate controlled, 2. Chiral auxiliary controlled, 3. Chiral reagent controlled and 4. Chiral catalyst controlled.

2. **Chiral Substrate controlled asymmetric synthesis:** Nucleophilic additions to chiral carbonyl compounds. 1, 2- asymmetric induction, Cram's rule and Felkin-Anh model.

3. **Chiral auxiliary controlled asymmetric synthesis:** α -Alkylation of chiral enolates, azaenolates, imines and hydrazones. 1,4-Asymmetric induction and Prelog's rule. Use of chiral auxiliaries in Diels-Alder reaction.

4. **Chiral reagent controlled asymmetric synthesis:** Asymmetric reductions using BINAL- H. Asymmetric hydroboration using IPC2 BH and IPCBH2.

5. **Chiral catalyst controlled asymmetric synthesis:** Sharpless and Jacobsen asymmetric epoxidations. Sharpless asymmetric dihydroxylation. Asymmetric hydrogenations using Noyori catalys. Enzyme mediated enantioselective synthesis

UNIT – III

15 Hrs

Photochemistry-I

Photochemical energy, Frank Condon Principle, Types of Electronic Excitation and Molecular orbital view of excitation, Jablonski Diagram, singlet and triplet states, dissipation of photochemical energy, photosensitization, quenching, quantum efficiency and quantum yield, Determination of Quantum yield

Photo Chemistry of Carbonyl Compounds: Norrish Type I reaction (alpha cleavage reaction), Norrish Type – II reaction, Paterno- Buchi reaction , Photo reduction & photo enolisation; photochemical Oxidations [Backstrom mechanism], Photo oxidation of alkenes with singlet oxygen.

Photochemistry-II

Di – Pi methane Rearrangement, Aza di – Pi methane rearrangement; Photochemistry of Benzene and substituted benzene, 1, 2 , 1,3 ,& 1, 4-additions; Photo Fries rearrangement of Phenolic acetates and Anilides; Photochemistry of unsaturated systems, Cis- Trans Isomerisation of alkenes (Direct and sensitized), Photoisomerisation of Stilbene, Photochemistry of Butadiene; Dimerisations of alkenes, Intramolecular dimerisation.

Photochemical rearrangement of Cyclohexadienenones, Photochemistry of alpha, beta Unsaturated ketones (dimerisations and addition across the double bond); Photochemical rearrangement reactions of Cyclohexenone, Photorearrangements of Beta, gamma unsaturated systems (Mechanism of 1,2 & 1,3 – acyl shifts); Photochemistry of Nitrite esters (Barton reaction), Photochemistry of alpha diazoketones

Text Books and Reference books:OUUIOI

- 1) Advanced Organic Chemistry: Reactions Mechanisms and Structure by Jerry March, Mc.Graw Hill and Kogakush.
- 2) Molecular reactions and Photochemistry by Charles Dupey and O. Chapman, Prentice Hall.
- 3) Mechanisms and Theory in Organic Chemistry by T.H. Lowery and K.S. Richardson.
- 4) Organic Chemistry, Clayden, Greeves and Stuart Warren.
- 5) Modern Organic Synthesis-an introduction by George S.Zweifel and Michael H. Nantz, W. H. Freeman & company, New York.
- 6) Organic Photochemistry by D Coyle
- 7) Molecular Photochemistry by Gilbert & Baggo
- 8) Organic Photochemistry by Turro
- 9) Photochemistry by C W J Well

SCIM GOVT COLLEGE (A) TANUKU
M.Sc (Final) Organic Chemistry Syllabus Semester-IV,
Course Code:
Paper – I- Assymmetric Synthesis and Organic Photochemistry
(w.e.f. 2025-26Admitted batch)

Blue Print

Sl. No.	Unit No.	Unit name	Essay questions (10M)	Short questions (4M)	Total questions
1	I	Assymmetric synthesis-I	2	2	4
2	II	Methodologies in Asymmetric Synthesis	2	2	4
3	III	Photo Chemistry-I	2	2	4
4	IV	Photo Chemistry-II	2	2	4
Total questions			8	8	16

SCIM GOVT COLLEGE (A) TANUKU
M.Sc (Final) Organic Chemistry Syllabus Semester-IV,
Course Code:
Paper – I- Assymmetric Synthesis and Organic Photochemistry
(w.e.f. 2025-26Admitted batch)

Model Question paper

Time 3 hours

Max Marks: 60M

Section-A

Answer ALL Questions

(4x10=40 Marks)

1. write a short note about the following
3. Homotopic and Heterotopic groups and faces. (5 M)
 - i) Pro-R and pro-S, Re and Si (5 M)
- Or
2. Write a short note about the following (5+5)M
 - ii) Substrate stereo selectivity and product stereo selectivity.
 - iii) Chiral shift reagents and chiral HPLC
3. Write about chiral substrate controlled asymmetric synthesis.
(OR)
4. i. Write about 1, 4-Asymmetric induction and Prelog's rule
ii. Write about Sharpless and Jacobsen asymmetric epoxidation.
5. Write about the following.
 - i. Jablonski Diagram
 - ii. Photosensitization,(OR)
6. Explain Norrish Type I reaction and Norrish Type II reaction.
7. Write about the following
 - i) Photo chemistry of Butadiene
 - ii. Dimerization of alkenes(OR)
8. Write about the Photo Fries rearrangement of Phenolic acetates and Anilides.

Section-B

Answer any FIVE of the following

(5x4=20 Marks)

9. Write about Reed reaction.
10. Write about the hydroxylation at aromatic carbon by Fenton's reagent.
11. write about chiral enolates.
12. Write about Noyori catalyst.
13. Write about quantum yield.
14. Write about photo oxidation of alkenes with singlet oxygen.
15. Write about photo Aromatic Substitutions
16. Write about the photo chemistry of Benzene and substituted Benzene

SCIM GOVT COLLEGE (A) TANUKU
M.Sc (Final) Organic Chemistry Syllabus
Semester-IV,
Course Code:
Paper – II- Organic Spectroscopy & Chromatography
(w.e.f. 2025-26Admitted batch)

UNIT-I:

15 Hrs

- A) **^{13}C NMR Spectroscopy:** Similarities and Differences between PMR and CMR. Types of ^{13}C NMR spectra: decoupled, proton- decoupled and off-resonance decoupled spectra. Chemical shift (aliphatic, olefinic, alkyne, aromatic, hetero aromatic and carbonyl carbon etc.). Calculation of chemical shifts of alkanes, alkenes and alkynes. Coupling constants Homo nuclear (^{13}C - ^{13}C J) and Hetero nuclear (^{13}C - ^1H J) coupling, DEPT Technique.
- B) **2D NMR spectroscopy:** Principles and classification of Correlation spectroscopy (COSY) HOMCOR: HOMO COSY (^1H - ^1H COSY), HETCOR: Hetero COSY (^1H - ^{13}C COSY) INADEQUATE, INDOR INEPT, NOESY, HMQC, HMBC.

UNIT-II

- A) **Optical Rotatory Dispersion:** Theory of Optical Rotatory Dispersion-Cotton effect – CD curves-types of ORD and CD curves–similarities and difference between ORD and CD curves.
- B) The octant rule-application in structural studies- α - halo keto rule.

Mossbauer Spectroscopy: Basic physical concepts, spectral line shape, isomer shift, quadrupole splitting, magnetic hyperfine interaction. Interpretation of Mossbauer parameters of ^{57}Fe , ^{99}Ru , ^{101}Ru , ^{195}Pt , ^{193}Ir and ^{110}Sn . Some special applications: Solid state reactions, thermal decomposition, ligand exchange, electron transfer, isomerism, surface studies and biological applications.

UNIT-III

15 Hrs

Instrumentation Techniques: X-Ray Photo-Electron Spectroscopy: Physical concepts. Application to determine atomic charges, oxidation numbers, catalyst surface structures and in some cases molecular structures.

UNIT-IV

15 Hrs

- B) **Separation Techniques:** Solvent extraction; chromatography- paper- thin layer- column chromatography, Electrophoresis.
- C) **Instrumentation–Gas Chromatography, High performance Liquid Chromatography.**

Suggested Books:

1. Spectroscopic Methods in Organic Chemistry- Seventh Edition, D.H. Williams and I. Fleming Tata - McGraw Hill, New Delhi, 1990.
2. Organic Spectroscopy- Third Edition, W. Kemp, ELBS Macmillan, 1987.

3. Spectrometric identification of Organic Compounds-Fourth Edition, R.M. Silverstein: G.C. Vassilr and T.C. Merill, John Wiley, Singapore, 1981.
4. Introduction to spectroscopy-D.L. Pavia, G.M. Lampman, G.S. Kriz, 3rd Ed (Harcourt college publishers).
5. "Applications of Optical rotation and Circular Dichroism", G.C. Barret, in "Elucidation of Organic structures by Physical and Chemical Methods" Part I (Eds) K.W. Bentley and G.W. Rirty John Wiley, 1972, Chapter VIII (only those aspects mentioned in the syllabus)

SCIM GOVT COLLEGE (A) TANUKU
M.Sc (Final) Organic Chemistry Syllabus
Semester-IV, Course Code:
Paper – II-Organic Spectroscopy & Chromatography
(w.e.f. 2025-26Admitted batch)

Blue Print

Sl.No.	Unit No.	Unit name	Essay questions (10M)	Short questions (4M)	Total questions
1	I	Optical Rotatory Dispersion	2	2	4
2	II	¹³ CNMR & 2D NMR	2	2	4
3	III	Mossbauer & X-Ray Photo-Electron Spectroscopy	2	2	4
4	IV	Separation Techniques	2	2	4
Total questions			8	8	16

SCIM GOVT COLLEGE (A) TANUKU
M.Sc (Final) Organic Chemistry Syllabus
Semester-IV, Course Code:
Paper – II- Organic Spectroscopy & Chromatography
(w.e.f. 2025-26 Admitted batch)

Model Question paper

Time 3 hours

Max Marks: 60M

Section A

Answer All Questions.

(4 x 10 = 40 M)

1. Write about
 - i. Cotton effect
 - ii. Explain the similarities and differences between CD and ORD curves

(OR)

2. Explain Octant Rule and its applications in structural studies.
3. Write about Similarities and Differences between PMR & CMR and DEPT.
4. Write about HOMCOR and HETCOR spectra
5. Discuss the factors influencing the shape and width of Mössbauer spectral lines.
6. Describe the physical principles of X-ray photo-electron spectroscopy.
7. Write a note on i) Paper chromatography
ii) Column chromatography.

(OR)

8. Write a note on i) Gas Chromatography
ii) HPLC

Section B

Answer any Five questions.

5 x 4 = 20 M

4. Explain the types of CD and ORD curves.
5. Write about Axial halo ketone rule
6. Explain the similarities and differences between ^1H and ^{13}C spectra.
7. Write about INADEQUATE spectra.
8. What is the basic principle of Mössbauer spectroscopy?
9. What are the limitations of XPS?
10. What is the principle of solvent extraction.
11. Write a note on TLC?

C-C, 1,2-C-C and 1,3-C-C); Synthesis of alkenes (Wittig disconnections and diene synthesis), Two group disconnections (Diels-Alder reaction and 1,3-difunctionalised compounds); Linear and convergent synthesis.

Textbooks and Books for Reference:

- 1) Some Modern Methods of Organic Synthesis W. Carothers, Fourth Edition, Cambridge University Press, Cambridge
- 2) Modern Organic Synthesis-An introduction by George S.Zweifel and Michael H. Nantz, W. H. Freeman & company, New York.
- 3) Advanced Organic Synthesis, Part B-Reactions and Synthesis, Francis A. Carey and Richard J. Sudenburg, 5th edition.
- 4) Organic Synthesis, Christine Willis and Martin Willis, Oxford Chemistry primers.
- 5) E. J. Corey and X. M. Cheng, The Logics of Chemical Synthesis, Wiley, 1989. 4. K. C. Nicolaou, Classics in Total Synthesis, Vol 1, 2 and 3.
- 6) S. Warren and P. Wyatt, Organic Synthesis: The Disconnection Approach, 2nd edition, Wiley, 2008.

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. (Final) Organic Chemistry Syllabus
Semester-IV, Course Code:
Paper-III Modern Organic Synthesis-II
(w.e.f 2025-26Admitted batch)

Blue Print

Sl.No.	Unit No.	Unit name	Essay questions (10M)	Short questions (4M)	Total questions
1	I	Oxidations	2	2	4
2	II	Reductions	2	2	4
3	III	Applications of Si, Li, Mg, Zn, Cr, Pd, Ti, Fe And Co Organometallic Reagents in Organic Synthesis	2	2	4
4	IV	Retro Synthetic Analysis	2	2	4
Total questions			8	8	16

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. (Final) Organic Chemistry Syllabus
Semester-IV, Course Code:
Paper-III Modern Organic Synthesis-II
(w.e.f 2025-26 Admitted batch)
Model Question Paper

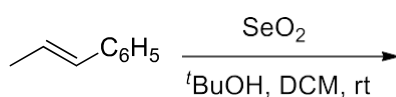
Time: 3Hrs

Max. Marks: 60

Answer all questions (A or B).

4X10= 40 marks

1. i. Write the product formation with mechanism.



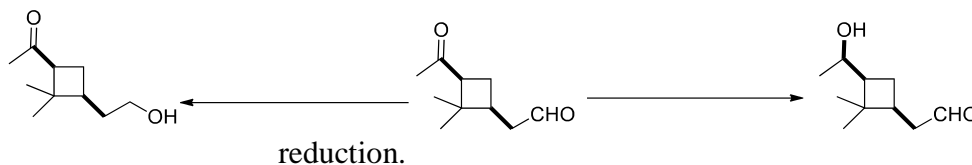
- ii. Explain 'Swern oxidation' with mechanism.

(OR)

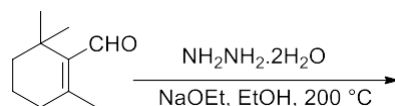
2. Mention the **special features** of the following reagents each with an example.

a). AgCO₃ on celite b). TPAP c). DMP d). TEMPO

3. i. Find the suitable reducing reagents and give proper reason for chemoselective

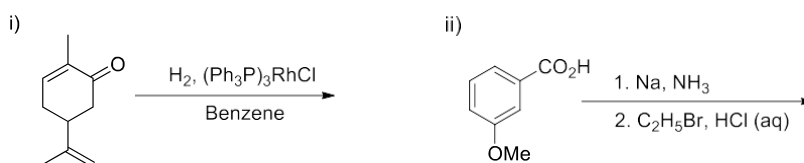


- ii. Explain the product formation with mechanism.



(OR)

4. Explain the product formation with proper reasoning.



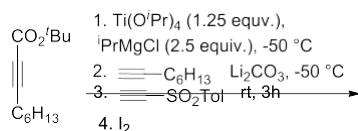
5. i. Write an application of Collman's reagent.

ii. Write about stille coupling.

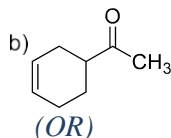
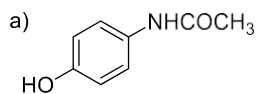
? (OR)

6. Derive the product formed.

i.



- ii. Explain briefly about Suzuki coupling, Sonogashira coupling with mechanism.
 7. Write the retrosynthesis analysis of



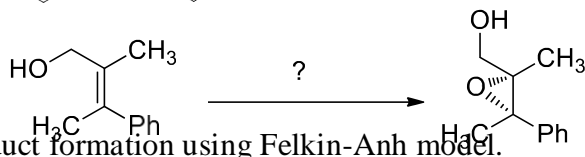
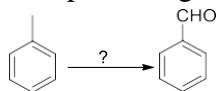
8. Write the retrosynthesis analysis of
 i. Aspirin ii. parabromoaniline

Section-B

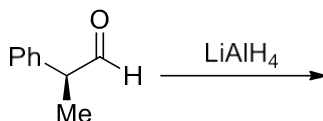
Answer **any five** of the following

(5X4= 20)

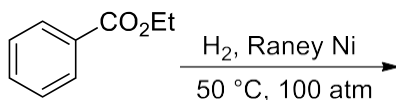
9. Write any suitable reagent for following conversion.
 10. Write the most suitable Sharpless reagents for this transformation.



11. Predict the major product formation using Felkin-Anh model.



12. Predict the major product formed in the reaction.



13. Write about Wacker Oxidation.
 14. Write Pauson-Khand reaction.
 15. Explain FGI with a suitable example.
 16. Differentiate Synthons and Synthetic Equivalent.

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. (Final) Organic chemistry Syllabus Semester-IV,
Course Code:
Paper – IV: BIO ORGANIC CHEMISTRY
(w.e.f 2025-26 Admitted batch)

Unit-I Polypeptides, Proteins & Lipids:

15 Hrs

Determination of structures of polypeptides – N-terminal and C-terminal amino acid determination – Sequence determination in polypeptides – polypeptide synthesis – Merrifield resins – Solid phase polypeptide synthesis. Classification, structures, and functions of primary, secondary and tertiary proteins. Enzyme nomenclature, enzyme kinetics and the Michaelis-Menten equation, various types of enzyme inhibition. application of enzymes in chemical synthesis, enzyme models and their applications.

Lipids:- Classification, chemistry, properties and function-free fatty acids, triglycerides, phospholipids, glycolipids & waxes conjugated lipids lipoproteins

UNIT-II Carbohydrates and Antibiotics:

Carbohydrates: Determination of the relative and absolute configuration in D-glucose and D-fructose. Structure elucidation and synthesis of Sucrose.

Classification of Antibiotics-Isolation, Structure determination, Synthesis and Stereochemistry of Pencillin-G, Streptomycin and Cephalosporin-C

UNIT –III Vitamins

Definition, occurrence, structural formulae, physiological functions and **synthesis** of Vitamins. Vitamins: Structure determination and synthesis of Retinol (A), Thiamine (B1), Riboflavin (B2), Pyridoxine (B₆) and Biotins (H), Nicotinic acid.

UNIT-IV NUCLEIC ACIDS

15 Hrs

Isolation, structure, and properties of RNA & DNA – synthesis of nucleosides, nucleotides, and synthesis of polynucleotides. Biosynthesis of RNA and DNA. Genetic Code, Finger Print test. Transcription, translation, replication: Messenger RNA, RNA polymerase and protein synthesis. Control of transcription and protein-DNA interactions.

Application of recombinant DNA technology in production of pharmaceuticals, diagnosis of diseases, insect control, improved biological detergents, gene therapy-examples.

Reference Books and Material:

1. Chemical Aspects of Biosynthesis, John Man, Oxford University Press, Oxford, 1996.
2. Chemistry of Natural Products: A Unified Approach, N. R. Krishnaswamy, University Press (India) Ltd., Orient Longman Limited, Hyderabad, 1999.
3. Biochemistry by D. Voet & J. G. Voet, 4th Edition (2010) Published by John Wiley (New York).
4. Lehninger's Principles of Biochemistry by D. L Nelson & M. M. Cox, 5th Edition (2008) Published by W. H. Freeman (New York) and CBS Publishers (New Delhi).
5. Biochemistry by J. M. Berg, J. L. Tymoczko & L. Stryer, 5th Edition (2002) Published by W. H. Freeman (New York).

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. (Final) Organic chemistry Syllabus Semester-IV,
Course Code:
Paper – IV: BIO ORGANIC CHEMISTRY
(w.e.f 2025-26 Admitted batch)

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S.NO.	UNIT NO.	UNIT NAME	ESSAY QUESTIONS (10 M)	SHORT QUESTIONS (4 M)	TOTAL QUESTIONS
1	UNIT-I	POLYPEPTIDES AND PROTEINS	2	2	4
2	UNIT-II	CARBOHYDRATES AND ANTIBIOTICS	2	2	4
3	UNIT-III	DRUGS	2	2	4
4	UNIT-IV	NUCLEIC ACIDS	2	2	4
TOTAL QUESTION			8	8	16

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. (Final) Organic chemistry Syllabus Semester-IV,
Course Code:
Paper – IV: BIO ORGANIC CHEMISTRY
(w.e.f 2025-26Admitted batch)

MODEL QUESTION PAPER

TIME: 3hrs

Maximum marks: 60M

SECTION – A

Answer ALL questions. Each question carries 10 marks.

(4x10=40M)

1. Write about the polypeptide synthesis?
(Or)
2. Write about the structure of proteins?
3. Write an essay on structural elucidation and absolute configuration of D-glucose?
(OR)
4. Structure determination, synthesis and stereochemistry of Pencil-G?
5. Write the synthesis of retinol and structure elucidation?
(OR)
6. Write the synthesis vitamin thiamine and structural elucidation?
7. Structure, isolation and properties of DNA and RNA?
(OR)
8. Describe the synthesis of nucleotides and nucleosides?

SECTION –B

Answer any FIVE questions

(5x4=20M)

9. What is isoelectric point?
10. Write the advantages of Merrifield peptide synthesis?
11. Explain about mutarotation?
12. Write brief explanation about disaccharides?
13. Discuss about structure-activity relationship of Streptomycin.
14. Write a short note vitamins?
15. Write a short note on purines and pyrimidines?
16. Write a short note on types of RNA?

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. (Final) Organic chemistry syllabus
Semester-IV, Practical Code:
Practical-I: ESTIMATIONS AND CHROMATOGRAPHY
(w.e.f 2025-26Admitted batch)

Laboratory Course-1	100 M
Laboratory Course-1 Estimations and Chromatography	100 M

1. Estimation of (a) Glucose (b) Phenol (c) Aniline (d) Acetone (e) Aspirin (f) Ibuprofen (g) Paracetamol
2. Separation by column chromatography: Separation of a mixture of ortho and para Nitroaniline using silica gel as adsorbent and chloroform as the eluent. The column chromatography should be monitored by TLC.

SCHEME OF VALUATION

Time: 3 Hours

Total: 100 marks

Internal: 40M

External: 60M (Record: 10 M Practical: 50M)

Project Work: 100 Marks (Dissertation: 50 Marks Viva Voice: 50 Marks)

SCIM GOVT COLLEGE (A) TANUKU
M.Sc. (Final) Organic chemistry syllabus
Semester-IV, Practical Code:
Practical-II: Spectral Identification of Organic Compound
(w.e.f 2025-26Admitted batch)

Spectral Identification of Organic Compounds (UV, IR, 1H- and 13C- NMR, MASS).

A minimum of 30 representative examples

should be **Books Suggested**

1. Modern Organic Synthesis in the Laboratory *A Collection of Standard Experimental Procedures*, Jie Jack Li, Chris Limberakis, Derek A. Pflum
2. Practical organic chemistry by Mann & Saunders
3. Text book of practical organic chemistry by Vogel
Spectrometric Identification of organic compounds, R.M. Silverstein, F.X. Webster and D.J.Kiemle, 7th Ed., (Wiley)

SCHEME OF VALUATION

Time: 3 Hours

Total: 100 marks

Internal: 40M

External: 60M (Record: 10 M Practical: 50M)