S.C.I.M. GOVT. COLLEGE

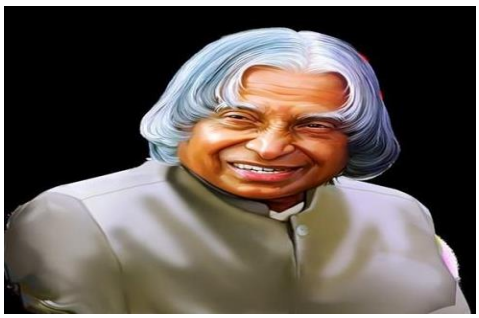
AUTONOMOUS

Accredited by NAAC 'A' Grade with CGPA 3.18

Tanuku, West Godavari, Andhra Pradesh. AISHE CODE-C-24205

(Affiliated to Adikavi Nannaya University, Rajamahendravaram) An ISO 9001,14001,50001 Institution

DEPARTMENT OF CHEMISTRY



A REPORT
ON
BOARD OF STUDIES (BOS)

FOR
THE ACADEMIC
YEAR 2025-26

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SCIM GOVERNMENT COLLEGE (A), TANUKU
DEPARTMENT OF CHEMISTRY
BOARD OF STUDIES (BoS) MEETING

The Board of Studies meeting of the Department of Chemistry was convened on September 22nd 2025, at11:00 AM onwards in the department itself, chaired by Dr. K. Raveendrababu, In-charge of the Chemistry Department. The members present discussed various agenda points including designing of the syllabus for the 1st and 2nd year BSc Chemistry (Honours), drafting question paper blueprints, creating model papers structure for internal and external assessments, planning practical examinations and organizing activities for the academic year 2025-26. The following members were attended the meeting.

List of BoS Members:

S. No.	Name Of The BoS Member	Member/Position	Address	Signature
1	Dr. K. Raveendrababu	Chairperson	SCIM GC(A), Tanuku	
2	Dr. T. Narasimha Murthy	University Nominee	Government College (A), Rajahmundry	
3	Dr. Ch. Ch. Gupta	Guest Of Honor	IIPE, Visakhapatnam	
4	Dr. U.V Subba Reddy	Subject Expert	GDC, Kadiri	
5	Sri. M.V. Premsagar	Subject Expert	GDC, Tadepalligudem	
6	Dr. N. Ramana	Member	ONGC, Rajahmundry	
7	Dr. P. Kamala	Staff Member	SCIM Govt. College (A), Tanuku	
8	Kum. K. DhanaLakshmi	Staff Member	SCIM Govt. College (A) Tanuku	
9	Sri. A. Surya Uma Maheshwararao	Staff Member	SCIM Govt. College (A) Tanuku	
10	A. Naga Satish	Alumnus	Ph.Dstudent,VIT, Amaravathi, Andhra Pradesh	

Agenda/Minutes of the BoS Meeting

The Department of Chemistry convened a Board of Studies (BoS) meeting on SEPTEMBER 22nd, 2025 to address various academic matters for the academic year 2025-26 are as follow

- Gathering feedback from stakeholders (faculty, students, industry experts) on the proposed syllabus.
- To Design and approve the syllabi and curriculum for UG Major Chemistry programme.
- To identify and suggest add-on courses and online certificate courses offered by various educational platforms,
- To Design and approve the syllabi and curriculum for multi-disciplinary and pathway courses (add-on/certificate programs).
- Framing and Finalizing the blueprint and model for question papers.
- To Review existing methods for internal assessment, suggest new methods, and approve them.
- To approve Question paper formats and blueprints for practical examinations.
- To approve a panel of question paper setters and External practical examiners
- To design an action plan for the academic year 2025-26.
- Any other matters with the permission of the chair.

B.Sc. CHEMISTRY PROGRAMME STRUCTURE UNDER SINGLE MAJOR SCHEME AY 2025-26

Year	Semester	Course	Course Code	Title of the Course	No. of Hrs /Week	Credits	Max.Internal/ External Marks
1	I	1		General Chemistry	3	3	40/60
				Qualitative Analysis of Simple Salt	2	1	50
		2		Inorganic Chemistry	3	3	40/60
				Inorganic Preparations	2	1	50
	II	3		Organic Chemistry – I (Structural Theory & Hydrocarbons)	3	3	40/60
				Organic Preparations	2	1	50
		4		Physical Chemistry – I (States of Matter, Phase rule & Surface Chemistry)	3	3	40/60
				Physical Chemistry – I Practical	2	1	50
COMMUNITY SERVICE PROJECT(CSP)						4	100
2	III	5		Fundamentals in Organic Chemistry	3	3	40/60
				Organic Qualitative analysis	2	1	50
		6		Organic Chemistry (Halogen & Oxygen Organic Compounds)	3	3	40/60
				Organic preparations	2	1	50
		7		Physical Chemistry-I (Solutions and Electrochemistry)	3	3	40/60
				Physical Chemistry	2	1	50
		8		Inorganic &Physical Chemistry	3	3	40/60

2				Qualitative inorganic analysis	2	1	50
	IV	9		Physical Chemistry-II (States of Matter, Phase Rule & surface Chemistry)	3	3	40/60
				Organic preparations	2	1	50
		10		General & Physical Chemistry	3	3	40/60
				Physical Chemistry - Volumetric Analysis	2	1	50
		11		Nitrogen containing Organic Compounds & Spectroscopy.	3	3	40/60
				Organic preparations and IR Spectral Analysis	2	1	50
SHORT TERM INTERNSHIP						4	100
3	V	12		Analytical Methods in Chemistry-Quantitative analysis. **(Or)** Environmental Chemistry	3	3	40/60
				Analytical Methods in Chemistry-Quantitative analysis. **(Or)** Environmental Chemistry	2	1	50
		13		Chromatography and Instrumental methods of Analysis. **(Or)** Green Chemistry and Nanotechnology	3	3	40/60
				Chromatography and Instrumental methods of Analysis. **(Or)** Green Chemistry and Nanotechnology	2	1	50
		14-A		Synthetic Organic Chemistry **(Or)** Industrial Chemistry Fertilizers and Surface coatings	3	3	40/60
				Synthetic Organic Chemistry **(Or)**	2	1	50

				Industrial Chemistry Fertilizers and Surface coatings			
		OR					
		14-B		Analysis of Organic Compounds . **(Or)** Industrial Chemistry Polymers and water analysis	3	3	40/60
		15-A		Analysis of Organic Compounds . (Or) Industrial Chemistry Polymers and water analysis	3	3	40/60
		15-B		Industrial Chemistry Polymers and water analysis			
		VI SEMESTER - INTERNSHIP					

S.C.I.M GOVERNMENT COLLEGE (A), TANUKU, WEST GODAVARI DT.					
BOARD OF STUDIES FOR THE ACADEMIC YEAR 2025-26 (2024-25 admitted students)					
DEPARTMENT OF CHEMISTRY					
DETAILS OF COURSE ADDTIONS,DELETIONS & JUSTIFICATION					
COURSE NO.	**COURSE CODE**	**TITLE OF THE COURSE**	**ADDITIONS**	**DELETIONS**	**JUSTIFICATION**
1		Essentials and Applications of Mathematical, Physical and Chemical Sciences			
2		Advances in Mathematical, Physical and Chemical Sciences			
3		General & Inorganic Chemistry			
		Analysis of Simple Salt- Practical Course			
4		Inorganic Chemistry-I			
		Preparation of Inorganic compounds- Practical Course			
5		Fundamentals in Organic Chemistry			
		Organic Qualitative analysis-Practical Course			
6		Organic Chemistry (Halogen & Oxygen Organic Compounds)			
		Organic preparations- Practical Course			
7		Physical Chemistry-I (Solutions and Electrochemistry)			
		Physical Chemistry- Practical Course			
8		Inorganic &Physical Chemistry			
		Qualitative inorganic analysis- Practical Course			

COURSE NO.	COURSECODE	TITLE OF THE COURSE	ADDITIONS	DELETIONS	JUSTIFICATION
9		Physical Chemistry-II (States of Matter, Phase Rule & surface Chemistry)			
		Organic preparations- Practical Course			
10		General & Physical Chemistry			
		Physical Chemistry - Volumetric Analysis- Practical Course			
11		Nitrogen containing Organic Compounds & Spectroscopy.			
		Organic preparations and IR Spectral Analysis- Practical Course			
12		Analytical Methods in Chemistry-Quantitative analysis. **(Or)** Environmental Chemistry			
13		Chromatography and Instrumental methods of Analysis. **(Or)** Green Chemistry and Nanotechnology			
4-A		Synthetic Organic Chemistry **(Or)** Industrial Chemistry Fertilizers and			
14-B		Analysis of Organic Compounds . **(Or)** Industrial Chemistry Polymers and water analysis			

I SEMESTER

SCIM GOVT. COLLEGE (A) TANUKU
Admitted Batch- 2025-26 AY
SEMESTER-I
Course Code 01: GENERAL CHEMISTRY

Theory Credits: 3 3 hrs/week

I. LEARNING OBJECTIVES:

1. To understand the structure of the atom and its relation to periodic properties.
2. To explain different types of chemical bonding-ionic, covalent, metallic, hydrogen bonding.
3. To apply bonding theories to predict molecular structure and bonding nature.
4. To correlate periodic trends with physical and chemical properties of elements.
5. To evaluate practical applications of nuclear chemistry in science and industry

II. COURSE OUTCOMES:

At the end of the course the student will be able to

1. Describe the electronic configuration of elements and periodic trends.
2. Analyze the formation and properties of ionic and covalent compounds.
3. Apply VSEPR, hybridization, and MOT to predict molecular geometry and bonding.
4. Explain metallic bonding, hydrogen bonding, and intermolecular forces and relate them to physical properties.
5. Explain types of radioactivity, nuclear reactions, and real-life applications.

III. SYLLABUS:

UNIT-1: ATOMIC STRUCTURE AND PERIODIC TABLE (9 h)

Wave mechanics: de Broglie equation, Heisenberg's Uncertainty Principle and its significance, Schrödinger's wave equation, significance of ψ and ψ^2. Quantum numbers and their significance. Electronic configuration- Aufbau principle, Hund's rule and Pauli's exclusion principle.

Periodic law and arrangement of elements in the periodic table, horizontal, vertical, and diagonal relationships in the periodic table. Definition and periodic trends of atomic radii, ionic radii, covalent radii, ionization potential, electron affinity, and electronegativity- Pauling scale, Mullikan, Allred Rachow scales, inert-pair effect.

UNIT-2: IONIC BOND (9 h)

Properties of ionic compounds, factors favouring the formation of ionic compounds, Lattice energy: definition, factors affecting lattice energy, Born-Haber cycle - enthalpy of formation of ionic compound and stability, covalent character in ionic compounds - polarization and Fajan's rules, effects of polarization.

Introduction to Ceramics: Al_20_3, SiC_2; Ionic Liquids introduction; concept of polymerization.

UNIT- 3: COVALENT BOND (9 h)

Valence Bond theory: Hybridization of atomic orbitals and geometry of molecules – $BeCl_2$, BF_3, CH_4, PCl_5, and SF_6

VSEPR model: Effect of bonding and non-bonding electrons on the structure of molecules – NH_3, H_2O, SF_4, ICl_2^- and XeF_4

Molecular orbital theory: LCAO method, construction of M.O. diagrams for homo nuclear and hetero nuclear diatomic molecules (N_2, O_2, CO and NO)

UNIT - 4: METALLIC AND WEAK BONDS (9 h)

Metallic bond: Metallic properties, free electron theory, valence bond theory, band theory of metals. Explanation of conductors, semi-conductors and insulators using band theory.

Weak Bonds: Intra and Inter-molecular hydrogen bonding, influence on the physical properties of molecules, various types of van der Waals forces.

UNIT-5: NUCLEAR CHEMISTRY (9 h)

Definition, Isotopes, n/p ratio, binding energy, types of radioactivity, Soddy-Fajan's displacement law, Law of Radioactivity, Radioactive decay series, Nuclear Reactions- Fission and Fusion, Applications of radioactivity in agriculture and medicine, Radiocarbon dating.

IV. REFERENCES:

1. J.D. Lee, Concise Inorganic Chemistry, 5^{th} edition (Latest edition).
2. B. R. Puri, L.R. Sharma, K.C. Kalia, Principles of Inorganic Chemistry,
3. D.F. Shriver and P.W. Atkins, Inorganic Chemistry, 3rd ed., W. H. Freeman and Co, London,
4. James E. Huheey, **Inorganic Chemistry: Principles of Structure and Reactivity**, 4^{th} ed., 2017.
5. W.U. Malik, G.D Tuli, R.D Madan, Selected Topics in Inorganic Chemistry, S. Chand Publishing, 1998.
6. H.J. Arnikar, Essentials of Nuclear Chemistry, New Age International Publishers, 2015.

V. PROPOSED ACTIVITIES:

1. Chart on periodic trends like radii, ionization energy, electronegativity across groups/periods.
2. Worksheet solving- MOT diagrams and hybridization problems.
3. Model Building-Build 3D structures using kits/software for CH_4, PCl_5, XeF_5 etc.

VI. CO-CURRICULAR ACTIVITIES AND ASSESSMENT METHODS

1. Continuous Internal Evaluation (CIA): Monitoring the progress of student's learning.
2. Class Tests, Worksheets, Quizzes, Industrial/Field visits, Student seminars, Poster and PPT presentations, Peer learning, Project-based learning, Assignments, Debates, Group Discussions: Enhances critical thinking skills.
3. Semester End Examination (SEE): Critical indicator of student's learning and teaching methods adopted by teachers throughout the semester.

SCIM GOVT. COLLEGE (A) TANUKU
Admitted Batch- 2025-26 AY
SEMESTER-I
Course Code 01: QUALITATIVE ANALYSIS OF SIMPLE SALT

Practical Credits: 1 2 hrs/week

I. LEARNING OBJECTIVES:

1. To understand the theoretical principles behind classical qualitative analysis of cations and anions.
2. To develop the ability to identify common cations and anions in inorganic salts.
3. To practice laboratory safety and correct handling of reagents.
4. To record and interpret observations accurately in systematic salt analysis.

II. COURSE OUTCOMES:

At the end of the course the student will be able to

1. Proper use of glassware, equipment and chemicals in the laboratory
2. Apply systematic procedures to identify one cation and one anion in a given inorganic salt.
3. Analyze reactions based on solubility, color changes, and precipitate formation.
4. Interpret results to draw conclusions and confirm the identity of ions.

III. SYLLABUS:

Analysis of simple salt containing **one anion and one cation** from the following:
Anions: Carbonate, sulphate, chloride, bromide, acetate, nitrate, borate, phosphate.
Cations: Lead, copper, iron, aluminium, zinc, nickel, manganese, calcium, strontium, barium, ammonium.

IV. REFERENCES

1. G. Svehla, Vogel's Textbook of Qualitative Inorganic Analysis, Pearson Education, 2008.
2. K. Nagaraj, S. Kamalesu, S. Lokhandwala, N.M. Parekh, Textbook of Semi-micro Inorganic Qualitative Analysis, Notion Press, 2023.
3. G. Pass, H. Sutcliff, Practical Inorganic Chemistry. 2nd edition, John-Wiley & Sons, 2020.

V. CO-CURRICULAR ACTIVITIES AND ASSESSMENT METHODS

1. Internal Practical Assessment
2. Lab Record Evaluation
3. Final Practical Examination
4. Oral/Viva Voce

SCIM GOVT. COLLEGE (A) TANUKU
Admitted Batch- 2025-26 AY
B.Sc Degree Examination Semester-I
Course Code: 01
Paper- I: General Chemistry
Blue Print

Sl.No	Unit No.	Unit Name	Essay Questions	Short Questions	Total Questions
1.	**I**	Atomic Structure And Periodic Table	2	2	4
2.	**II**	Ionic Bond	2	1	3
3.	**III**	Covalent Bond	2	2	4
4.	**IV**	Metallic And Weak Bonds	2	1	3
5.	**V**	Nuclear Chemistry	2	2	4
Total Questions			10	8	18

SCIM GOVT. COLLEGE (A) TANUKU
Admitted Batch- 2025-26 AY
MODEL QUESTION PAPER
Course Code: 01
Paper- I: General Chemistry

Max. Marks: 60 Time: 3h

SECTION-A

Answer any 5 questions. Each question carries 4 marks $5 \times 4 = 20M$

1. Explain Aufbau principle with suitable examples.
2. Briefly explain Inert pair effect and diagonal relationship
3. Write a note on stability of ionic compounds.
4. Explain structures of SF_4, NH_3 using VSEPR theory
5. Explain factors affecting lattice energy.
6. Explain hydrogen bonding and its types with examples.
7. Discuss Soddy-Fajan's displacement law
8. Explain Radiocarbon dating.

SECTION-B

Answer all the questions, each question carries 08 marks $5 \times 08 = 40M$

9. Write about briefly a) Heisenberg's Uncertainty Principle and its significance, b) Schrödinger's wave equation, significance of ψ and ψ^2.

(OR)

10. Explain periodic trends atomic radii, ionic radii, covalent radii, ionization potential, electron affinity, and electronegativity.
11. Explain (a) Factors favouring the formation of ionic compounds. (b) Fajan's rules

(OR)

12. Define Lattice energy and explain the lattice energy determination of an ionic compound using Born –Haber Cycle.
13. Describe the salient features of MOT. Construct the MO diagrams for O_2 and CO molecules.

(OR)

14. Explain Valence bond theory and concept of hybridization by taking any two examples.
15. Write about Band theory of metals. Explain about conductors, semiconductors and insulators.

(OR)

16. Explain types of hydrogen bonding and its influence on physical properties of molecules.
17. Define radioactivity. Explain laws of Radioactivity. **(OR)**
18. Discuss Nuclear Reactions (Fission and Fusion) and mention few applications of radioactive isotopes.

SCIM GOVT. COLLEGE (A) TANUKU
Admitted Batch- 2025-26 AY
SEMESTER-I
Course Code 2: INORGANIC CHEMISTRY

Theory Credits: 3 3 hrs/week

I .LEARNING OBJECTIVES:

1. To explain preparation and uses of selected p-block compounds.
2. To understand the structural and chemical properties of selected p-block compounds.
3. To classify and analyze the characteristics of d- and f-block elements.
4. To compare the properties of lanthanides and actinides.
5. To understand the processes involved in the extraction of metals from their ores.

II. COURSE OUTCOMES:

At the end of the course the student will be able to

1. Explain the structures and preparation of key p-block compounds.
2. Classify d- and f-block elements and discuss their properties and oxidation states.
3. Analyze magnetic, catalytic, and color properties of transition metals.
4. Compare and contrast lanthanides and actinides based on electronic configuration.
5. Explain and differentiate various metallurgical processes used in the extraction of metals

III. SYLLABUS:

UNIT-1: CHEMISTRY OF p-BLOCK ELEMENTS – I (9 h)

Group 13: Preparation and structure of Diborane, Borazine and (BN)x.
Group 14: Preparation, classification and uses of silicones. Silanes.
Group 15: Preparation and structure of Phosphonitrilic Chloride $P_3N_3Cl_6$.

UNIT-2: CHEMISTRY OF p-BLOCK ELEMENTS – II (9 h)

Group 16: Classification of oxides, structures of oxides, oxoacids and per-oxo acids of sulphur.
Group 17: Preparation and structures of Interhalogen compounds, Pseudohalogens.

UNIT-3: CHEMISTRY OF d-BLOCK ELEMENTS (9 h)

Characteristics of d-block elements with special reference to electronic configuration, variable valency, colour, magnetic properties, catalytic properties and ability to form complexes. Stability of various oxidation states of 3d-series.

UNIT-4: CHEMISTRY OF f-BLOCK ELEMENTS (9 h)

Chemistry of Lanthanides: Electronic configuration, oxidation states, colour, magnetic properties, lanthanide contraction, consequences of lanthanide contraction.
Chemistry of Actinides: Electronic configuration, oxidation states, actinide contraction, comparison of lanthanides and actinides.

UNIT-5: GENERAL PRINCIPLES OF METALLURGY (9 h)

Occurrence of metals, minerals and ores, Concentration of ores- levigation, magnetic separation, froth floatation, leaching, Conversion of concentrated ores to oxide- calcination and roasting, reduction of oxide to the metal, Refining of crude metal-distillation, liquation, poling, electrolysis, zone refining and vapour phase refining, Corrosion and its prevention, Alloys.

IV. REFERENCES:

1. J. D. Lee, Concise Inorganic Chemistry, 5th ed., Blackwell Science, London, 1996.
2. B.R. Puri, L.R. Sharma, K.C. Kalia, Principles of Inorganic Chemistry, Shoban Lal Nagin Chand and Co., 1996.
3. D.F. Shriver, P.W. Atkins, Inorganic Chemistry, W. H. Freeman and Co, London, 1999.
4. J.E. Huheey, **Inorganic Chemistry: Principles of Structure and Reactivity**, 4th ed., 2017.
5. A.K. Das, Fundamentals of Metallurgy. Tata McGraw Hill Education, 2011.

V. PROPOSED ACTIVITIES:

1. Group discussion: Trends in d-block and f-block properties across periods and groups.
2. Comparative worksheet: Lanthanide vs Actinide behaviour.
3. Seminar: Uses of metals in daily life.

VI. CO-CURRICULAR ACTIVITIES AND ASSESSMENT METHODS:

1. Continuous Internal Evaluation (CIA): Monitoring the progress of student's learning.
2. Class Tests, Worksheets, Quizzes, Industrial/Field visits, Student seminars, Poster and PPT presentations, Peer learning, Project based learning, Assignments, Debates, Group Discussions: Enhances critical thinking skills.
3. Semester End Examination (SEE): Critical indicator of student's learning and teaching methods adopted by teachers throughout the semester.

SCIM GOVT. COLLEGE (A) TANUKU
Admitted Batch- 2025-26 AY
SEMESTER-I
Course Code 2: INORGANIC PREPARATIONS
Practical Credits: 1 2 hrs/week

I. LEARNING OBJECTIVES:

1. To understand and apply stoichiometry and principles of inorganic salt preparation.
2. To learn techniques such as crystallization, filtration, and drying.
3. To calculate percentage yields.
4. To handle reagents and lab apparatus safely and precisely

II. COURSE OUTCOMES:

At the end of the course the student will be able to
1. Demonstrate safe use of laboratory equipment and chemical handling.
2. Describe the theoretical background for the preparation of inorganic salts.
3. Perform synthesis of potash alum, ferrous salts, and cuprous chloride following proper procedures.
4. Analyze colour changes, crystal formation, and yields to evaluate reaction completion.

III. SYLLABUS:

1. Preparation of Potash alum.
2. Preparation of Ferrous oxalate
3. Preparation of Ferrous ammonium sulphate.
4. Preparation of Cuprous chloride.
5. Preparation of Chrome alum.

IV. REFERENCES:

1. G. Svehla, Vogel's Textbook of Qualitative Inorganic Analysis, Pearson Education, 2008.
2. G.H. Jeffery, J. Bassett, J. Mendham, R.C. Denney, Vogel's Textbook of Quantitative Chemical Analysis, John Wiley and Sons, 1989.

V. CO-CURRICULAR ACTIVITIES AND ASSESSMENT METHODS:

1. Internal Practical Assessment
2. Lab Record Evaluation
3. Final Practical Examination
4. Oral/Viva Voce

SCIM GOVT. COLLEGE (A) TANUKU

Admitted Batch- 2025-26 AY

B.Sc Degree Examination Semester-I

Course Code: 02

Paper- II: Inorganic Chemistry

Blue Print

Sl.No	Unit No.	Unit Name	Essay Questions	Short Questions	Total Questions
1.	**I**	Chemistry Of P-Block Elements – I	2	2	4
2.	**II**	Chemistry Of P-Block Elements – Ii	2	2	4
3.	**III**	Chemistry Of D-Block Elements	2	2	4
4.	**IV**	Chemistry Of F-Block Elements	2	1	3
5.	**V**	General Principles Of Metallurgy	2	1	3
Total Questions			10	8	18

SCIM GOVT. COLLEGE (A) TANUKU

Admitted Batch- 2025-26 AY

B.Sc Degree Examination Semester-I

MODEL QUESTION PAPER

Course Code: 02

Paper- II: Inorganic Chemistry

Max.60M **Time: 3h**

SECTION– A

Answer any 5 questions. Each question carries 4 marks 5 × 4 = 20M

1. Explain the structure and bonding of borazine.
2. Explain the structure of $P_3N_3Cl_6$.
3. Write a short note on pseudo halogens.
4. Explain the structure of oxoacids of sulphur.
5. Explain the catalytic properties of d-block elements.
6. Explain why Ti^{+3} & Cu^{+2} exhibit colour and Ti^{+4} & Cu^{+1} not?
7. Describe comparison of lanthanides and actinides.
8. Explain the process of calcination and roasting.

SECTION –B

Answer the following questions. Each one carries 8 marks 5×8M=40M

9. Write the preparation and structure of diborane.

(OR)

10. What are silicones? Write the classification, preparation and applications of silicones.
11. Describe the structures of oxoacids and peroxo acids of sulphur.

(OR)

12. Explain the structures of Interhalogen compounds.
13. Explain the following properties of d-block elements a) magnetic properties b) ability to form complexes (OR)
14. Explain a) variable valency b) color properties of d-block elements.
15. Define lanthanide contraction. Explain consequences of lanthanide contraction.

(OR)

16. Explain the following properties of actinides a) electronic configuration, b) oxidation states
17. Explain the methods of refining of metals a) electrolysis b) zone refining c) Distillation

(OR)

18. Describe the methods of concentration of ores a) Magnetic separation b) Froth flotation

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II SEMESTER

SCIM GOVT. COLLEGE (A) TANUKU
Admitted Batch- 2025-26 AY
SEMESTER-II
Course Code 3: ORGANIC CHEMISTRY-I
Theory Credits: 3 3 hrs/week

I. LEARNING OBJECTIVES:

1. To understand the structural theory behind reactivity in organic chemistry.
2. To identify and classify hydrocarbons, their reactions, and stability.
3. To explain organic reaction mechanisms and orientation in aromatic substitution.
4. To apply concepts like resonance, inductive effects, hyperconjugation, and aromaticity.
5. To analyze stereochemistry through molecular representations and optical activity.

II. COURSE OUTCOMES:

At the end of the course, the student will be able to:
1. Study Inductive effect, Mesomeric effect, Hyperconjugation and its applications.
2. Explain the preparation and chemical properties of alkanes, alkenes, alkynes and benzene.
3. Analyze and apply Huckel's rule to benzenoid and non-benzenoid aromatic compounds.
4. Differentiate between Markownikoff and Anti-markownikoff addition, Ring activating and deactivating groups.
5. Interpret stereochemical representations and identify chiral molecules.

III. SYLLABUS:

UNIT-1: STRUCTURAL THEORY IN ORGANIC CHEMISTRY (9 h)

Functional groups in organic chemistry, Types of bond fission, Electrophiles, Nucleophiles, Reactive intermediates- generation, structure and reactions - carbocations, carbanions, free radicals and carbenes, Nitrenes, Benzynes. Bond polarization effects - 1. Inductive effect and its applications: (a) Basicity of amines and (b) Acidity of carboxylic acids, (c) stability of carbocations and carbanions 2. Resonance or Mesomeric effect and its applications: (a) Acidity of phenol, and (b) Acidity of carboxylic acids. 3. Hyperconjugation and its application to the stability of carbonium ions.

UNIT-2: SATURATED HYDROCARBONS (ALKANES & CYCLOALKANES) (9 h)

Types of organic reactions: Addition, Elimination, Substitution and Rearrangement reactions.
Alkanes: conformations of ethane, propane, butane, Preparation of alkanes by Wurtz reaction, Kolbe's synthesis, Corey- House synthesis. Free radical Substitution: Halogenation.
Cycloalkanes: Cycloalkanes and their relative stability – Baeyer's strain theory, Cyclohexane conformations with energy diagram.

UNIT-3: UNSATURATED HYDROCARBONS (ALKENES & ALKYNES) (9 h)

Alkenes: Preparation- Elimination reactions dehydration of alcohols, dehydrohalogenation of alkylhalides (Saytzeff and Hofmann eliminations), Reactions: Electrophilic Additions of X_2, H_2O, HX to alkene (Markownikoff and *anti*-Markownikoff addition), Ozonolysis, hydroboration.
Alkynes: Preparation - acetylene from CaC_2 and conversion into higher alkynes, by dehalogenation of tetra halides. Reaction- Addition of X_2, H_2O, HX to alkynes, acidity and alkylation of terminal alkynes.

UNIT-4: AROMATICITY, BENZENE AND ITS REACTIVITY (9 h)

Aromaticity: Concept of aromaticity,. Huckel's rule - application to Benzenoid (Benzene, Naphthalene) and Non-Benzenoid compounds (cyclopropenyl cation, cyclopentadienyl anion and tropylium cation); Antiaromaticity, Non-Aromaticity. Electrophilic aromatic substitution benzene- Halogenation, Nitration, Friedel-Craft's alkylation and Friedel- Craft's acylation.

Orientation of aromatic substitution: *Ortho-*, *para-* and *meta-* directing groups with examples. Ring activating and deactivating groups with examples.

UNIT- 5: STEREOCHEMISTRY OF CARBON COMPOUNDS (9 h)

Molecular representations - Wedge, Fischer, Newman and Saw-Horse formulae.

Chirality & Optical isomerism: Concept of chirality Chiral molecules- Symmetry,elements-enantiomers and diastereomers, *Meso* Compounds; Optical activity, optical rotation and specific rotation. Explanation of optical isomerism with examples- Glyceraldehyde, Lactic acid, and Tartaric acid. Relative configuration (D, L- notation), Absolute configuration- CIP rules, (R, S- Configuration).

Geometrical isomerism: *cis–trans* and, *syn-anti* isomerism *E/Z* notations with C.I.P rules.

IV. REFERENCES:

1. R.N. Morrison, R.N. Boyd, Organic Chemistry, Pearson Education, 7th edition, 2010.
2. Peter Sykes, Guidebook to Mechanism in Organic Chemistry, 6th edition, 1985.
3. S.P. Singh, O. Prakash, Reaction mechanism in organic chemistry, Laxmi Publications, 2017.
4. P.Y. Bruice, Organic Chemistry, 8th Edition, Pearson, 2017.
5. V.K. Ahluwalia, P. Bhagat, R. Aggarwal, R. Chandra, Intermediate for Organic Synthesis, I.K. International. 2005.
6. T.W.G. Solomons, C.B. Fryhle, S.A. Snyder, Organic Chemistry, 12th Edition, Wiley, 2016.
7. P.S. Kalsi, Stereochemistry, New Age International, 2015.
8. D. Nasipuri, Stereochemistryof organic compounds, New Age International, 2020.

V. PROPOSED ACTIVITIES:

1. Mechanism writing exercises- Electrophilic aromatic substitution, electrophilic additions.
2. Group quiz on directive effects and reactive intermediates.
3. Concept mapping-Properties of alkane, alkene, alkyne, benzene.

VI. CO-CURRICULAR ACTIVITIES AND ASSESSMENT METHODS:

1. Continuous Internal Evaluation (CIA): Monitoring the progress of student’s learning
2. Class Tests, Worksheets, Quizzes, Industrial/Field visits, Student seminars, Poster and PPT presentations, Peer learning, Project-based learning, Assignments, Debates, Group Discussions: Enhances critical thinking skills.
3. Semester End Examination (SEE): Critical indicator of student’s learning and teaching methods adopted by teachers throughout the semester.

SCIM GOVT. COLLEGE (A) TANUKU

Admitted Batch- 2025-26 AY

SEMESTER-II

Course Code 3: ORGANIC PREPARATIONS

Practical Credits: 1 2 hrs/week

I. LEARNING OBJECTIVES:

1. Understand mechanisms and conditions for common organic synthesis reactions (nitration, bromination, esterification, acetylation).
2. Perform organic synthesis using appropriate techniques such as heating, reflux, crystallization, and filtration.
3. Develop safe laboratory practices and chemical handling procedures.

II. COURSE OUTCOMES:

At the end of the course, the student will be able to:
1. Describe the theoretical background and reaction mechanisms of organic preparations.
2. Synthesize organic compounds using standard laboratory procedures.
3. Analyze reaction steps and evaluate the melting point, and yield of synthesized products.
4. Relate synthesis methods to pharmaceutical and industrial applications.

III. SYLLABUS:

1. Preparation of di nitrobenzene
2. Preparation of p-nitroacetanilide
3. Preparation of nerolin
4. Preparation of aspirin (Acetylsalicylic acid)
5. Preparation of paracetamol (Acetaminophenol)

6. REFERENCES:

a. B.S. Furniss, A.J. Hannaford, P.W.G. Smith, A.R.Tatchell, Vogel's Textbook of Practical Organic Chemistry, Pearson, 2012.

b. V.K. Ahluwalia, R. Agarwal, Comprehensive Practical Organic Chemistry, University Press, 2010.

7. CO-CURRICULAR ACTIVITIES AND ASSESSMENT METHODS:

a. Internal Practical Assessment
b. Lab Record Evaluation
c. Final Practical Examination
d. Oral/Viva Voce

SCIM GOVT. COLLEGE (A) TANUKU

Admitted Batch- 2025-26 AY

B.Sc Degree Examination Semester-II

Course Code: 03

Paper- I: Organic Chemistry – I (Structural Theory & Hydrocarbons)

Blue Print

Sl.No	Unit No.	Unit Name	Essay Questions	Short Questions	Total Questions
1.	**I**	Structural Theory In Organic Chemistry	2	2	4
2.	**II**	Saturated Hydrocarbons (Alkanes & Cycloalkanes)	2	2	4
3.	**III**	Unsaturated Hydrocarbons (Alkenes & Alkynes)	2	2	4
4.	**IV**	Aromaticity, Benzene And Its Reactivity	2	1	3
5.	**V**	Stereochemistry Of Carbon Compounds	2	1	3
Total Questions			10	8	18

SCIM GOVT. COLLEGE (A) TANUKU

Admitted Batch- 2025-26 AY

B.Sc Degree Examination Semester-II

MODEL QUESTION PAPER

Course Code: 03

Paper- I: Organic Chemistry – I (Structural Theory & Hydrocarbons)

Max. Marks :60M **Time: 3h**

SECTION– A

Answer any 5 questions. Each question carries 4 marks 5 × 4 = 20M

1. Define electrophiles and nucleophiles with suitable examples.
2. Explain inductive effect and its application on acidity of carboxylic acids.
3. Describe addition and elimination reactions with an example each.
4. Explain the conformations of cyclohexane with energy diagram.
5. Differentiate between Saytzeff and Hofmann eliminations with examples.
6. Write notes on Markovnikov's and Anti-Markovnikov's addition rules.
7. State Huckel's rule and apply it to benzene.
8. Define enantiomers and diastereomers with examples.

SECTION – B

Answer the following questions. Each one carries 8 marks 5×8M=40M

9. Discuss resonance effect with examples. Apply it to acidity of phenol.

Or

10. Explain the generation, structure and stability of carbocation, carbanion and free radicals with examples.
11. Describe Corey–House synthesis of alkanes. Discuss substitution reactions of alkanes.

Or

12. Explain Baeyer's strain theory of cycloalkanes and discuss stability of cyclopropane and cyclobutane.
13. Explain electrophilic addition of HX, X_2 and H_2O to alkenes with mechanisms.

Or

14. Write notes on:
    (i) Ozonolysis of alkenes
    (ii) Hybroboration
15. Discuss electrophilic substitution reactions of benzene – Nitration, Halogenation, Friedel–Craft's alkylation.

Or

16. Explain the concepts of activating and deactivating groups in substituted benzenes with examples.
17. Describe optical activity and explain chiral carbon atom with examples.

Or

18. Explain R–S configuration using Cahn–Ingold–Prelog (CIP) rules with suitable examples.

SCIM GOVT. COLLEGE (A) TANUKU

Admitted Batch- 2025-26 AY

SEMESTER-II

Course Code 4: PHYSICAL CHEMISTRY-I

Theory Credits: 3 3 hrs/week

I. LEARNING OBJECTIVES:

1. To understand the theoretical principles governing gases, liquids, solids, and colloidal systems.
2. To apply gas laws and interpret the behavior of real and ideal gases.
3. To describe physical properties of matter in various states and relate them to structural features.
4. To interpret phase diagrams and apply Gibbs' phase rule to one- and two-component systems.

II. COURSE OUTCOMES:

At the end of the course, the student will be able to:

1. Explain gas laws, ideal and real gases behaviour, and critical phenomena.
2. Describe properties of liquids and classify types and applications of liquid crystals.
3. Derive Bragg's equation and identify types of crystal defects.
4. Apply the phase rule to interpret phase diagrams and systems with eutectic/congruent/incongruent points.
5. Differentiate between types of adsorption and colloidal systems, and evaluate their applications.

III. SYLLABUS:

UNIT-1: GASEOUS STATE (9 h)

Gas laws, Ideal Gas equation, Vander Waal's equation of state, Andrew's isotherms of carbon dioxide, Critical phenomena, Relationship between critical constants and van der Waal's constants, Law of corresponding states, Joule-Thomson effect, Inversion temperature.

UNIT-2: LIQUID STATE (9 h)

Physical properties of liquids: Definition of vapour pressure, boiling point, surface tension and coefficient of viscosity, Classification of Surfactants, Critical Micellar Concentration(CMC), Effect of temperature and addition of solutes on surface tension and viscosity.

Liquid crystals: Mesomorphic state, Differences between liquid crystal and solid/liquid. Classification of liquid crystals, Application of liquid crystals.

UNIT-3: SOLID STATE (9 h)

Law of constancy of interfacial angles, The law of rationality of indices- Miller indices, Directional Indices ,Symmetry in crystals, definition of lattice point, space lattice, unit cell, Bravais lattices and crystal systems, X-ray diffraction and crystal structure, Bragg's law and its derivation, Defects in crystals: Stoichiometric and Non-stoichiometric defects.

UNIT-4: PHASE RULE (9 h)

The concept of phase, components, degrees of freedom, Gibbs phase rule, Phase diagram of one component system – water system, Definition and examples for systems having

congruent and incongruent melting point, Study of Phase diagrams of Simple eutectic systems (i) Pb-Ag system, desilverisation of lead (ii) NaCl-Water system, freezing mixtures

UNIT-5: SURFACE CHEMISTRY (9 h)

Colloids: Definition and classification of Colloids, Coagulation of colloids, Hardy-Schulze rule. Stability of colloids, Protection of Colloids-Gold number.

Adsorption: Physical and chemical adsorption, Freundlich and Langmuir adsorption isotherm, applications of adsorption.

IV. REFERENCES:

1. P.W. Atkins, J. de., Paula, Atkin's Physical Chemistry, 10th Edition, Oxford University Press, 2014.
2. D.W. Ball, Physical Chemistry, 2nd Edition, Cengage Learning, 2017.
3. G.W. Castellan, Physical Chemistry, 4th Edition, Narosa, 2014.
4. K.L. Kapoor, A Textbook of Physical Chemistry, 6th Edition, McGraw-Hill Education, 2015.

V. PROPOSED ACTIVITIES:

1. Model building: Bravais lattices and symmetry in crystals
2. Chart preparation of phase diagrams (Water, Pb-Ag, NaCl-H2O)
3. PPT: Adsorption isotherms or colloidal behavior.
4. List out applications of Liquid crystals in different display devices.
5. Peer Teaching: Phase rule and eutectic systems

VI. CO-CURRICULAR ACTIVITIES AND ASSESSMENT METHODS:

1. Continuous Internal Evaluation (CIA): Monitoring the progress of student's learning
2. Class Tests, Worksheets, Quizzes, Industrial/Field visits, Student seminars, Poster and PPT presentations, Peer learning, Project-based learning, Assignments, Debates, Group Discussions: Enhances critical thinking skills.
3. Semester End Examination (SEE): Critical indicator of student's learning and teaching methods adopted by teachers throughout the semester.

SCIM GOVT. COLLEGE (A) TANUKU
Admitted Batch- 2025-26 AY
SEMESTER-II
Course Code 4: PHYSICAL CHEMISTRY-I PRACTICAL

Practical Credits: 1 2 hrs/week

I. LEARNING OBJECTIVES:

1. To understand the concepts of surface tension and viscosity of liquids.
2. To familiarize students with using different lab equipment and glassware for the determination of the coefficient of viscosity and surface tension.
3. To gain hands-on experience in preparing colloidal solutions.

II. COURSE OUTCOMES:

At the end of the course, the student will be able to:

1. Use glassware, equipment and follow experimental procedures in the laboratory.
2. Determine surface tension and viscosity using standard experimental techniques.
3. Prepare colloidal solutions and study their stability.
4. Conduct adsorption experiments and verify Freundlich isotherm

III. SYLLABUS:

1. Determination of surface tension of liquid by drop count method.
2. Determination of surface tension of liquid by drop weight method.
3. Determination of coefficient of viscosity of an organic liquid.
4. Preparation of sols: $Al(OH)_3$, $Fe(OH)_3$ and starch.
5. Adsorption of acetic acid on animal charcoal, verification of Freundlich isotherm.

IV. REFERENCES:

1. B.D. Khosla, V.C. Garg, A. Gulati, Senior Practical Physical Chemistry, R. Chand & Co, New Delhi, 2015.
2. K.L. Kapoor, A Textbook of Physical Chemistry, McGraw-Hill Education, 2019.
3. C.W. Garland, J.W. Nibler, D.P. Shoemaker, Experiments in Physical Chemistry, 8th Edition, McGraw-Hill, New York, 2003.

V. CO-CURRICULAR ACTIVITIES AND ASSESSMENT METHODS:

1. Internal Practical Assessment
2. Lab Record Evaluation
3. Final Practical Examination
4. Oral/Viva Voce

SCIM Govt. College (A), TANUKU
Admitted batch 2025-26 AY

B.Sc Degree Examination Semester-II

Course Code: 04

Paper- II: Physical Chemistry – I (States of Matter, Phase rule & Surface Chemistry)

Blue Print

Sl.No	Unit No.	Unit Name	Essay Questions	Short Questions	Total Questions
1.	**I**	Gaseous State	2	2	4
2.	**II**	Liquid State	2	2	4
3.	**III**	Solid State	2	2	4
4.	**IV**	Phase Rule	2	1	3
5.	**V**	Surface Chemistry	2	1	3
Total Questions			10	8	18

SCIM Govt. College (A), TANUKU
Admitted batch 2025-26 AY
MODEL QUESTION PAPER
SEMESTER-II
Course Code 4: Physical Chemistry-I

Max. Marks: 60 Time: 3h

Section – A

Answer any 5 questions. Each question carries 4 marks 5 × 4 = 20M

1. State and explain Boyle's law and Charles' law.
2. What is critical temperature? Explain the relationship between critical constants and van der Waal's constants.
3. Define viscosity. Explain the effect of temperature on viscosity of liquids.
4. Write a note on classification of liquid crystals into smectic and nematic.
5. What are Miller indices? Explain with an example.
6. Explain stoichiometric and non–stoichiometric defects in crystals.
7. Write short notes on Hardy–Schulze rule
8. Describe Congruent and incongruent melting points.

Section – B

Answer the following questions. Each one carries 8 marks 5×8M=40M

9. Derive Vander Waal's equation of state. **OR**
10. Explain Joule–Thomson effect and inversion temperature.
11. Define surface tension. Discuss the effect of solutes on surface tension. **OR**
12. Write short notes on mesomorphic state of liquid crystaL
13. Derive Bragg's law of X–ray diffraction. **OR**
14. Discuss various types of crystal defects
15. State Gibbs' phase rule. Explain the terms phase, components, and degrees of freedom**.**

OR

16. Draw and explain the phase diagram of NaCl–H_2O system
17. Explain the classification of colloids. **OR**
18. Explain Langmuir adsorption isotherm with equation and its applications.

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III SEMESTER

SCIM GOVT. COLLEGE (A) TANUKU
Admitted Batch- 2024-25 AY
III –SEMESTER
Course Code 5: FUNDAMENTALS IN ORGANIC CHEMISTRY

Theory Credits: 3 3 hrs/week

Course outcomes:

At the end of the course, the student will be able to:

1. Understand and explain the differential behaviour of organic compounds based on fundamental concepts learnt.
2. Formulate the mechanism of organic reactions by recalling and correlating the fundamental properties of the reactants involved.
3. Learn and identify many organic reaction mechanisms .
4. Correlate and describe the stereo-chemical properties of organic compounds and reactions.

Syllabus:

Unit 1. Structural theory in Organic Chemistry (9 h)

Types of bond fission and organic reagents (Electrophilic, Nucleophilic, and free radical reagents). Reaction intermediates – Carbocations, carbanions& free radicals. Bond polarization: Factors influencing the polarization of covalent bonds, inductive effect - Application of inductive effect (a) Basicity of amines (b) Acidity of carboxylic acids (c) Stability of carbonium ions. Resonance or Mesomeric effect, application to (a) acidity of phenol, and (b) acidity of carboxylic acids.Hyper conjugation and its application to stability of carbonium ions, Free radicals and alkenes.

Unit II Saturated Hydrocarbons (Alkanes and Cycloalkanes) 9 h

General methods of preparation of alkanes- Wurtz and WurtzFittig reaction, Corey House synthesis, physical and chemical properties of alkanes, Conformational analysis of alkanes (Conformations, relative stability and energy diagrams of Ethane, Propane and butane).

General molecular formulae of cycloalkanes and relative stability, Baeyer strain theory, Cyclohexane conformations with energy diagram, Conformations of monosubstituted cyclohexane.

UNIT-III Unsaturated Hydrocarbons (Alkenes and Alkynes) 9 h

General methods of preparation, physical and chemical properties, Saytzeff and Hoffmann eliminations (with mechanism), Electrophilic Additions, (H_2, HX) mechanism (Markownikoff/ Antimarkownikoff addition) with suitable examples-*syn* and *anti*-addition; addition of X_2, HX. Oxymercuration-demercuration, ozonolysis, hydroxylation, Diels Alder reaction, 1,2- and1,4-addition reactions in conjugated dienes.

Reactions of alkynes; acidity, electrophilic and nucleophilic additions, hydration to form carbonyl compounds, Alkylation of terminal alkynes.

UNIT-IV Benzene and its reactivity (9 h)

Structure of Benzene – Preparation - (2+2+2) Cyclization of acetylene and decarboxylation-Properties -mechanism of electrophilic aromatic substitution reaction- halogenations, nitration, sulphonation, Friedel- Craft's alkylation and acylation.

UNIT-V Orientation of aromatic substitution (9 h)

Concept of aromaticity, Huckel's rule - application to Benzenoid (Benzene, Naphthalene) and Non - Benzenoid compounds (cyclopropenyl cation, cyclopentadienyl anion and tropylium cation) Anti-Aromaticity, Non-Aromaticity. Orientation of aromatic substitution - *ortho, para* and *meta* directing groups. Ring activating and deactivating groups with examples (Electronic interpretation of various groups like NO_2 and Phenolic). Orientation of (i) Amino, methoxy and methyl groups (ii) Carboxy, nitro, nitrile, carbonyl and sulphonic acid groups (iii) Halogens.

II. List of Reference Books

1. PY Bruice, Organic Chemistry, latest edition.
2. Morrison, R. N. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
3. Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
4. Guide book to Mechanism in Organic Chemistry by Peter Sykes 6th edition, 1985.

SCIM GOVT. COLLEGE (A) TANUKU
Admitted Batch- 2024-25 AY
III –SEMESTER
Course Code 5: ORGANIC QUALITATIVE ANALYSIS

Practical Credits: 1 2 hrs/week

Organic Qualitative analysis

Course outcomes:

At the end of the course, the student will be able to;

1. Use glassware, equipment and chemicals and follow experimental procedures in the laboratory
2. Determine melting and boiling points of organic compounds
3. Understand the application of concepts of different organic reactions studied in theory part of organic chemistry 1. Continuous Evaluation: Monitoring the progress of student's learning
2. Class Tests, Worksheets and Quizzes
3. Presentations, Projects and Assignments and Group Discussions: Enhances critical thinking skills and personality
4. SEMESTER -End Examination: critical indicator of student's learning and teaching methods adopted by teachers throughout the SEMESTER .

Syllabus:

Analysis of an organic compound through systematic qualitative procedure for functional group identification including the determination of melting point and boiling point with suitable derivatives. Alcohols, Phenols, Aldehydes, Ketones, Carboxylic acids, Aromatic primary amines, amides and simple sugars.

Co-curricular activities and Assessment Methods

Reference books:

1) Vogel A.I .Practical Organic Chemistry, Longman Group Ltd.
2) Bansal R.K. Laboratory Manual of Organic Chemistry, Wiley-Eastern.
3) Ahluwalia V. K. and Agarwal R. Comprehensive Practical Organic Chemistry, University press.

SCIM GOVT. COLLEGE (A) TANUKU
Admitted Batch- 2024-25 AY
B.Sc Degree Examination Semester-III
Course Code: 05
Paper- : Fundamentals in Organic Chemistry
Blue Print

Sl.No	Unit No.	Unit Name	Essay Questions	Short Questions	Total Questions
1.	**I**	Structural theory in Organic Chemistry	2	2	4
2.	**II**	Saturated Hydrocarbons (Alkanes and Cycloalkanes)	2	1	3
3.	**III**	Unsaturated Hydrocarbons (Alkenes and Alkynes)	2	2	4
4.	**IV**	Benzene and its reactivity	2	1	3
5.	**V**	Orientation of aromatic substitution	2	2	4
Total Questions			10	8	18

SCIM GOVT. COLLEGE (A) TANUKU
Admitted Batch- 2024-25 AY
MODEL QUESTION PAPER
Course Code: 05
Paper- : Fundamentals in Organic Chemistry

Max marks: 60 **Time: 3h**

SECTION – A

Answer any **FIVE** from the following questions. (5x4 = 20 M)

1. Describe the types of bond fissions.
2. Describe the hyperconjugation with an example.
3. What are the axial and equatorial positions in cyclohexane chair conformation? What is the stable chair conformation for methylcyclohexane and why?
4. Explain the acidity of terminal alkynes.
5. 1,2- and 1,4-addition reactions of 1,3-butadiene.
6. Write any two methods for the preparation of benzene
7. Explain the concept of Aromaticity.
8. Explain the orientation effect of halogens.

SECTION – B

Answer any **Five** of the following questions. (5x8 = 40M)

9. Define inductive effect. How do you explain the following based on Inductive effect i) Stability of carbocations ii) Basicity of amines. **(OR)**
10. Define resonance effect. Explain the following based on resonance effect i) acidity of phenol ii) Acidity of carboxylic acids.
11. Explain the stability of cycloalkanes based on Baeyer's strain theory and mention its limitations. **(OR)**
12. Write any two methods of preparations of alkanes. Explain halogenation of alkanes with mechanism?
13. Explain i) Saytzeff rule of elimination ii) Diels-Alder reaction.

(OR)

14. Explain the mechanism of Markownikoff and Anti-Markownikoff addition of HBr to alkene?
15. Explain the mechanism of Friedal-craft's acylation and Friedal-craft's alkylation of Benzene. **(OR)**
16. Describe nitration and halogenation of benzene with mechanism.
17. What is Huckel's rule? Explain the aromaticity of benzenoid and non- benzenoid compounds with suitable examples? **(OR)**
18. What is orientation effect? Explain the orientation effect of ring activating and deactivating groups with one example each.

SCIM GOVT. COLLEGE (A) TANUKU
Admitted Batch- 2024-25 AY
III -SEMESTER
Course Code 6: ORGANIC CHEMISTRY
(Halogen and Oxygen containing organic compounds)

Theory **Credits: 3** **3hrs/week**

Course outcomes:

At the end of the course, the student will be able to:

1. Understand the concept of $SN_1$and$SN_2$and SN_i mechanisms.
2. Describe the reactivity of alcohols and phenols.
3. Achieve the skills required to propose various mechanisms
4. Apply the concepts for synthesising various oxygen containing organic compounds
5. Interconvert the monosaccharides.

Syllabus:

Unit – I Halogen compounds (9 h)

Alkyl halides: Preparation of alkyl halides from i) alkanes, ii) alkenes and iii) alcohols. Properties - nucleophilic substitution reactions–$SN_1$and SN_2 and SN_i mechanisms with energy profile diagrams, stereo chemical aspects and effect of solvent. Williamson's synthesis.

Aryl halides: Preparation i) from phenols ii) Sandmeyer's reaction, nucleophilic aromatic substitution (Benzyne mechanism);relative reactivity of alkyl, allyl, vinyl and benzyl, aryl halides towards nucleophilic substitution reactions.

Unit II Alcohols and Phenols (9 h)

Alcohols: Preparation of 1^0,2^0,3^0 alcohols from Grignard's reagent, Bouveault–Blanc Reduction; Chemical properties – substitution of –OH by using Halogenation and with HX / $ZnCl_2$, Oxidation of alcohols with PCC, PDC; Oxidation of diols by HIO_4 and $Pb(OAc)_4$, PinacolPinacolone arrangement with mechanism, relative reactivity of 1°, 2°, 3°alcohols.

Phenols; Preparation from diazonium salt and Cumene. Reactions and mechanism–Reimer–Tiemann**,**Kolbe–Schmitt Reactions, Fries and Claisen rearrangements.

Unit III Carbonyl Compounds (9 h)

Preparation from-Acid chlorides,1,3-dithiane and nitriles; Structure and reactivity of carbonyl group, Nucleophilic addition reactions with HCN, NaHSO3 and alcohols. addition-elimination reactions with hydroxylamine, hydrazine, 2,4DNP. Oxidations and reductions (Clemmensen's, Wolf–Kishner's, withLiAlH4 & $NaBH_4$).

Reaction & Mechanism- Aldol condensation, Cannizzaro reaction, Perkin reaction, Benzoin condensation, Claisen-Schmidt reaction, Haloform reaction.

Unit-IV Carboxylic acid and Active methylene Compounds (9h)

Carboxylic Acids: Preparation from Grignard reagent and hydrolysis of nitriles, Reactions of monocarboxylic acids- Reactions involving -H, -OH and-COOH groups, formation of salts, esters, acidchlorides, amides and anhydrides. Degradation of carboxylic acids by Huns-Diecker's reaction, decarboxylation by Schmidt reaction, Arndt-Eistert synthesis, halogenation by Hell- Volhard- Zelinsky reaction. Mechanisms of acidic and alkaline hydrolysis of esters, Reformatsky reactions, Curtius rearrangement.

Active methylene compounds: *Keto-enol* tautomerism, preparation of Acetoacetic Ester (AAE) by Claisen condensation with mechanism, synthetic applications of AAE in the preparation of mono carboxylic acids, di-carboxylic acids.

Unit V: Carbohydrates (9 h)

Classification and their biological importance, Monosaccharides: Structural elucidation of glucose and fructose, epimers and anomers, mutarotation, determination of ring size of glucose and fructose, Haworth projections and conformational structures; Interconversions of aldoses and ketoses; Killiani-Fischer synthesis and Ruff degradation; Disaccharides– Haworth structure of maltose, lactose and sucrose.

II. List of Reference Books

1) PY Bruice, Organic Chemistry, Latest edition.
2) Morrison, R. N. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (PearsonEducation).
3) Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
4) Guide book to Mechanism in Organic Chemistry by Peter Sykes 6th edition,1985.

SCIM GOVT. COLLEGE (A) TANUKU
Admitted Batch- 2024-25 AY
III - SEMESTER
Course Code 6: ORGANIC PREPARATIONS

Practical Credits: 1 2 hrs/week

Course outcomes:

1. How to use glassware, equipment and chemicals and follow experimental procedures in the laboratory.
2. How to calculate limiting reagent, theoretical yield, and percent yield.
3. How to perform common laboratory techniques including reflux, distillation, recrystallization, vacuum filtration.
4. How to critically evaluate data collected to determine the identity, purity and percent yield of products and to summarize findings in writing in a clear and concise manner.

On the completion of the course, the student will be able to do the following:

Syllabus - Organic preparations (50M)

i. Acetylation of β-naphthol, vanillin and salicylic acid by:
a) Using conventional method
b) Using green approach
ii. Preparation of Nerolin

Co-curricular activities and Assessment Methods;

1. Continuous Evaluation: Monitoring the progress of student's learning
2. Class Tests, Worksheets and Quizzes
3. Presentations, Projects and Assignments and Group Discussions: Enhances critical thinking skills and personality
4. SEMESTER -End Examination: critical indicator of student's learning and teaching methods adopted by teachers throughout the SEMESTER .

Reference books:

1. Vogel A.I .Practical Organic Chemistry, Longman Group Ltd.
2. Bansal R.K. Laboratory Manual of Organic Chemistry, Wiley-Eastern.
3. Ahluwalia V. K. and Agarwal R. Comprehensive Practical Organic Chemistry, University press.

SCIM GOVT. COLLEGE (A) TANUKU
Admitted Batch- 2024-25 AY
B.Sc Degree Examination Semester-III
Course Code: 06
Paper- : Organic Chemistry (Halogen & Oxygen Organic Compounds)
Blue Print

Sl.No	Unit No.	Unit Name	Essay Questions	Short Questions	Total Questions
1.	**I**	Halogen compounds	2	1	3
2.	**II**	Alcohols and Phenols	2	2	4
3.	**III**	Carbonyl Compounds	2	2	4
4.	**IV**	Carboxylic acid and Active methylene Compounds	2	2	4
5.	**V**	Carbohydrates	2	1	3
Total Questions			10	8	18

SCIM GOVT. COLLEGE (A) TANUKU

Admitted Batch- 2024-25 AY

MODEL QUESTION PAPER

Organic Chemistry (Halogen & Oxygen Organic Compounds)

Max marks: 60 Time: 3h

SECTION – A

Answer any **FIVE** from the following questions. **(5x4 = 20 M)**

1. Briefly explain the relative reactivity of alkyl, allyl, and vinyl halides towards nucleophilic substitution reactions.
2. Explain Pinacol Pinacolone arrangement with mechanism.
3. How can be the 1°, 2°, 3° alcohols distinguished with lucas reagent.
4. Write the Wolf Kishner's reduction and Baeyer-Villiger oxidation of carbonyl compounds
5. Explain haloform reaction with mechanism.
6. Write the HVZ reaction and Arndt-Eistert reaction.
7. Write about Keto-enoltautomerism of active methylene compounds.
8. Describe epimers and anomers with an example.

SECTION – B

Answer any **Five** of the following questions. **(5x8 = 40M)**

9. Discuss the mechanism and stereochemistry of S_N1 and S_N2 reactions.

(OR)

10. Write a short note on the following i) Sandmeyer reaction ii) nucleophilic aromatic substitution (Benzyne mechanism)
11. Write the preparation of alcohols using Grignard reagent and Bouveault - Blanc reduction. **(OR)**
12. Explain Reimer-Tiemann reaction and Claisen rearrangement with mechanism.
13. Explain aldol reaction and benzoin condensation with mechanism.

(OR)

14. How does a carbonyl compound react with the following reagents
    i)HCN ii)2,4 DNP iii) NH_2OH iv) ROH
15. Explain the acidic and basic hydrolysis of esters with mechanism.

(OR)

16. Write the preparation and any two synthetic applications of Aceto Acetic Ester.
17. Discuss the constitution and configuration of glucose. Draw the Haworth and conformational structure of Glucose. **(OR)**
18. Explain the following i) Fischer Killiani Synthesis & ii) Ruffs Degradation.

SCIM GOVT. COLLEGE (A) TANUKU
Admitted Batch- 2024-25 AY
III – SEMESTER
Course Code 7: PHYSICAL CHEMISTRY – I
(Solutions & Electro Chemistry)

Theory **Credits: 3** **3 hrs/week**

Course outcomes:

At the end of the SEMESTER the student will be able to

1. Understand the ideal and non ideal behaviour of solutions.
2. Determine the molecular mass of non-volatile solutes.
3. Discuss the basic concepts of Photochemistry.
4. Apply the principles of electrical conductivity.
5. Explain the importance of emf and its applications.

Syllabus:

Unit I: Solutions (9 h)

Classification - Miscible, Partially miscible and Immiscible - Raoult's Law - Azeotropes- HCl-H_2O system and ethanol-water system. Partially miscible liquids-phenol- water system. Critical solution temperature (CST), Effect of impurity on consulate temperature. Immiscible liquids and simple distillation, steam distillation, Fractional Distilation. Nernst distribution law. Calculation of the partition coefficient. Applications of distribution law.

Unit II: Colligative Properties (9 h)

Relative lowering of Vapour Pressure, Elevation in boing point, depression in freezing point and Osmotic pressure. Determination of molecular mass of non-volatile solute by Ostwald- Walker method, Cottrell's method, Rast method and Barkeley-Hartley method.
Abnormal colligative properties.Van't Hoff factor.

Unit III: Photochemistry (9h)

Difference between thermal and photochemical processes, Laws of photochemistry- Grothus-Draper's law and Stark-Einstein's law of photochemical equivalence, Quantum yield- Photochemical reaction mechanism- hydrogen- chlorine and hydrogen- bromine reaction. Qualitative description of fluorescence, phosphorescence, Jablonski diagram, chemiluminescence - Photosensitized reactions- energy transfer processes (simple example), quenching, Photo stationary state.

Unit IV: Electrochemistry-I (9 h)

Conductance, Specific conductance, equivalent conductance and molar conductance - effect of dilution. Cell constant. Strong and weak electrolytes, Kohlrausch's law and its applications, Definition of transport number, determination of transport number by Hittorf's method. Debye-Huckel theory for strong electrolytes, Debye-Huckel - Onsagar's equation for strong electrolytes (derivation excluded), Application of conductivity measurements- conductometric titrations.

Unit V: Electrochemistry-II (9 h)

Electrochemical Cells- Single electrode potential, Types of electrodes with examples: Metal-metal ion, Gas electrode, Inert electrode, Redox electrode, Metal-metal insoluble salt- salt anion. Determination of EMF of a cell, Nernst equation, Applications of EMF measurements - Potentiometric titrations. Fuel cells – Basic concepts, examples and applications.

List of Reference books:

1) Principles of physical chemistry by Prutton and Marron
2) Solid State Chemistry and its applications by Anthony R. West
3) Text book of physical chemistry by K L Kapoor
4) Text book of physical chemistry by S Glasstone
5) Advanced physical chemistry by Bahl and Tuli
6) Advanced physical chemistry by Gurudeep Raj
7) Principles of physical chemistry by Puri, Sharma and Pathania

SCIM GOVT. COLLEGE (A) TANUKU
Admitted Batch- 2024-25 AY
III - SEMESTER
Course Code 7: PHYSICAL CHEMISTRY -I

Practical **Credits: 1** **2 hrs/week**

I. Course outcomes:

At the end of the course, the student will be able to:

1. Use of glassware, equipment and chemicals and follow experimental procedures in the laboratory.
2. Understand and apply the concepts of solutions practically.
3. Apply concepts of electrochemistry in experiments.

II. Syllabus:

CST, Conductometric and Potentiometric Titrimetry50 M

1. Determination of CST for Phenol-water system.
2. Effect of electrolyte on CST.
3. Conductometric titration - Determination of concentration of HCl solution using standard NaOH solution.
4. Conductometric titration – Determination of concentration of CH_3COOH Solution using standard NaOH solution.
5. Potentiometric titration-Determination of concentration of HCl using standard NaOH solution.

III. Co-curricular activities and Assessment Methods;

1) Continuous Evaluation: Monitoring the progress of student's learning
2) Class Tests, Worksheets and Quizzes
3) Presentations, Projects and Assignments and Group Discussions: Enhances critical thinking skills and personality
4) SEMESTER -End Examination: critical indicator of student's learning and teaching methods adopted by teachers throughout the SEMESTER .

IV. List of reference books:

1) A Text Book of Quantitative Inorganic Analysis(3rdEdition) –A.I.Vogel
2) Web related references suggested by teacher.

SCIM GOVT. COLLEGE (A) TANUKU
Admitted Batch- 2024-25 AY
B.Sc Degree Examination Semester-III
Course Code: 07
Paper- : Physical Chemistry-I (Solutions and Electrochemistry)

Blue Print

Sl.No	Unit No.	Unit Name	Essay Questions	Short Questions	Total Questions
1.	**I**	Solutions	2	2	4
2.	**II**	Colligative Properties	2	1	3
3.	**III**	Photochemistry	2	2	4
4.	**IV**	Electrochemistry-I	2	1	3
5.	**V**	Electrochemistry-II	2	2	4
Total Questions			10	8	18

SCIM GOVT. COLLEGE (A) TANUKU
Admitted Batch- 2024-25 AY
B.Sc Degree Examination Semester-III
Course Code: 07
Paper- : Physical Chemistry-I (Solutions and Electrochemistry)

MODEL QUESTION PAPER

Max. Marks: 60 Time: 3h

SECTION – A

Answer any **FIVE** from the following questions. **(5x4 = 20 M)**

1. Explain Raoul's law and write its applications
2. State and explain Nernst distribution law
3. Define Van't Hoff factor. Write short notes on abnormal colligative properties
4. Explain photochemical reaction between H_2 and Cl_2 with mechanism.
5. Write the differences between photochemical reactions and thermal reactions
6. Define conductance, specific conductance, equivalent conductance and molar conductance.
7. Write Nernst equation and explain the terms involved in it
8. What are fuel cells? Mention its applications

SECTION – B

Answer any Five of the following questions. (5x8 = 40M)

9. What is Critical Solution Temperature? Explain the Critical solution temperature of Water- Phenol system **(OR)**
10. What are azeotrope mixture? Explain briefly HCl-H_2O system and ethanol-water system.
11. Define Osmotic pressure. Describe the measurement of osmotic pressure is by Berkeley and Hartley's method. **(OR)**
12. What is depression in freezing point? Describe any one method for determining depression in freezing point.
13. Explain the Laws of photochemistry. Describe quantum efficiency.

(OR)

14. Explain electronic transitions occur in a molecule with the help of Jablonski diagram.
15. State and explain Kohlrausch's law. Write its applications

(OR)

16. What is Transport number? Describe deterimination of Transport number by Hittorff method.
17. Describe conductometric titrations. **(OR)**
18. Write notes on the following
    (i) Metal – metal ion electrode
    (ii) Gas electrode
    (iii) Redox electrode

SCIM GOVT. COLLEGE (A) TANUKU
Admitted Batch- 2024-25 AY
B.Sc Degree Examination Semester-III
III -SEMESTER
COURSE CODE: 8: INORGANIC AND PHYSICAL CHEMISTRY

Theory **Credits: 3** **3 hrs/week**

I. Course outcomes:

At the end of the SEMESTER the student will be able to:
1) Apply IUPAC nomenclature for Coordination compounds
2) Understand the various theories, structure and stereo chemistry of coordination compounds.
3) Explain the reaction mechanism in complexes.
4) Apply the 18 electron rule.
5) Discuss the basic concepts of thermodynamics.

II. Syllabus:

Unit I Coordination Chemistry-I (9 h)

IUPAC nomenclature of Coordination compounds, structural and stereo isomerism in complexes with coordination numbers 4 and 6. Valence Bond Theory (VBT): Postulates- Inner and outer orbital complexes, Limitations of VBT. CFT- Postulates- Splitting in Octahedral, tetrahedral, tetragonal and square planar fields. Crystal field stabilization energy (CFSE), Crystal field effects for weak and strong fields. Factors affecting the magnitude of crystal field splitting energy, Spectrochemical series, Tetragonal distortion of octahedral geometry-Jahn-Teller distortion.

UNIT–II Coordination Chemistry II (9 h)

1. Inorganic molecular Reaction Mechanism: (**6 h)**

Introduction to inorganic reaction mechanisms. Concept of reaction pathways, transition state, intermediate and activated complex. Labile and inert complexes, ligand substitution reactions in octahedral complexes – S_N1 and S_N2 reactions; Substitution reactions in square planar complexes- Trans-effect, theories of trans-effect and its applications.

2. Stability of metal complexes: (3 h)

Thermodynamic stability and kinetic stability, factors affecting the stability of metal complexes, chelate effect, determination of composition of complex by Job's method and mole ratio method.

Unit III Organo metallic compounds (9 h)

Definition and classification of organometallic Compounds on the basis of bond type, Metalcarbonyls:18 electron rule, electron count of mononuclear, poly nuclear and substituted metal carbonyls of 3d series. General methods of preparation of mono and binuclear carbonyls of 3d series. π-acceptor behaviour of CO (MO diagram of CO to be discussed), synergic effect and use of IR data to explain extent of back bonding.

Unit IV Thermodynamics- I (9 h)

Concept of heat (q), work(w), internal energy (U), State function and Path function, statement of first law; enthalpy(H), relation between heat capacities (C_p and C_v), calculations of q, w, U and H for reversible, irreversible processes, Joule-Thomson effect- coefficient, Calculation of work for the expansion of perfect gas under isothermal and adiabatic conditions for reversible processes. Temperature dependence of enthalpy of formation- Kirchoff's equation.

Unit V Thermodynamics II (9 h)

Second law of thermodynamics, Different Statements of the law, Carnot cycle and its efficiency, Carnot theorem, Concept of entropy, entropy as a state function, entropy changes in reversible and irreversible processes. Entropy changes in spontaneous and equilibrium processes. Third law of thermodynamics, Nernst heat theorem, Spontaneous and non- spontaneous processes, Helmholtz and Gibbs equation - Criteria for spontaneity.

III. List of Reference Books:

1) Concise coordination chemistry by Gopalan and Ramalingam
2) Coordination Chemistry by Basalo and Johnson
3) Text book of physical chemistry by S Glasstone
4) Concise Inorganic Chemistry by J.D.Lee
5) Advanced Inorganic Chemistry Vol-I by Satyaprakash, Tuli, Basu and Madan
6) A Text Book of Physical Chemistry by K.L.KapoorVol 2, 6th edition, 2019.

SCIM GOVT. COLLEGE (A) TANUKU
Admitted Batch- 2024-25 AY
III - SEMESTER
COURSE CODE 8: QUALITATIVE INORGANIC ANALYSIS

Practical **Credits: 1** **2 hrs/week**

Course outcomes:

At the end of the course, the student will be able to:

1) Understand the basic concepts of qualitative analysis of inorganic mixture.
2) Use glassware, equipment and chemicals and follow experimental procedures in the laboratory.
3) Apply the concepts of common ion effect, solubility product and concepts related to qualitative analysis.

Analysis of Mixture 50M

Analysis of mixture salt containing two anions and two cations (From two different groups) from the following:

Anions: Carbonate, Sulphate, Chloride, Bromide, Acetate, Nitrate, Borate, Phosphate. **Cations:** Lead, Copper, Iron, Aluminium, Zinc, Nickel, Manganese, Calcium, Strontium, Barium, magnesium and Ammonium.

Minimum of Six mixtures should be analyzed.

Co-curricular activities and Assessment Methods

1) Continuous Evaluation: Monitoring the progress of student's learning
2) Class Tests, Worksheets and Quizzes
3) Presentations, Projects and Assignments and Group Discussions: Enhances critical thinking skills and personality
4) SEMESTER - End Examination: critical indicator of student's learning and teaching methods adopted by teachers throughout the SEMESTER .

List of Text books:

1. A textbook of qualitative inorganic analysis by A.I. Vogel.

Blue Print

Sl.No	Unit No.	Unit Name	Essay Questions	Short Questions	Total Questions
1.	**I**	Coordination Chemistry-I	2	2	4
2.	**II**	Coordination Chemistry II	2	1	3
3.	**III**	Organo metallic compounds	2	2	4
4.	**IV**	Thermodynamics- I	2	1	3
5.	**V**	Thermodynamics II	2	2	4
Total Questions			10	8	18

MODEL QUESTION PAPER

Max. Marks: 60 Time: 3h

SECTION – A

Answer any **FIVE** from the following questions. **(5x4 = 20 M)**

1. Discuss the stereoisomerism in complexes with coordination number 6.
2. Write a short note on "Jahn-Teller distortion"
3. Explain the Trans – effect.
4. Explain the pi-acceptor behaviour of CO ligand
5. Write any two methods for the preparation of metal carbonyls
6. Explain state function and path function.
7. Write a short note on second law of thermodynamics.
8. Write a short note on third law of thermodynamics.

SECTION – B

Answer any **Five** of the following questions. **(5x8 = 40M)**

9. What are the postulates of Valence Bond theory? Explain Inner and Outer orbital complexes using VBT. **(OR)**
10. Explain the crystal field splitting in octahedral and tetrahedral complexes.
11. Explain the S_N1 and S_N2 or (associative and dissociative) ligand substitution reactions in octahedral complexes. **(OR)**
12. Describe Job's method for the determination of composition of a complex.
13. What are organometallic compounds? Discuss their Classification on the basis of type of bonds with examples. **(OR)**
14. What is 18-electron rule? Describe the 18-electron rule of mono nuclear and polynuclear metal carbonyls with suitable examples.
15. i) . State and explain first law of thermodynamics ii) Define heat capacities (Cp and Cv) and derive the relation Cp – Cv = R. **(OR)**
16. i) Derive the workdone for the reversible isothermal expansion of an ideal gas
    ii) Derive Kirchoff 's equation.
17. Describe Carnot's cycle and derive the efficiency of heat engine working between two temperatures. **(OR)**
18. i) Describe Spontaneous and non- spontaneous processesii) What is Gibbs-Helmholtz equation and explain it's importance.

IV SEMESTER

SCIM GOVT. COLLEGE (A) TANUKU
Admitted Batch- 2024-25 AY
IV - SEMESTER
COURSE CODE 9: PHYSICAL CHEMISTRY -II
(States of Matter, Phase Rule & Surface Chemistry)

Theory Credits: 3 3hrs/week

I. Course outcomes:

At the end of the SEMESTER the student will be able to:

1. Explain the difference between solids liquids and gases in terms of intermolecular interactions.
2. Differentiate ideal and real gases.
3. Discuss the basic concepts of two component systems
4. Apply the concepts of adsorption.
5. Understand the basic concepts of crystallography.

II. Syllabus:

Unit I - Gaseous state (9 h)

Postulates of Kinetic theory of Gases (exclude derivation) – deduction of gas laws from kinetic gas equation-Vander Waal's equation of state. Andrew's isotherms of carbon dioxide, continuity of state. Critical phenomena. Relationship between critical constants and vander Waal's constants. Law of corresponding states. Joule- Thomson effect. Inversion temperature.

Unit II – Liquid State (9 h)

Physical properties of liquids; vapour pressure, surface tension and coefficient of viscosity, and their determination. Effect of addition of various solutes on surface tension and viscosity.
Temperature variation of viscosity of liquids and comparison with that of gases. Qualitative discussion of structure of water.
Liquid crystals, mesomorphic state. Differences between liquid crystal and solid/liquid. Classification of liquid crystals into Smectic and Nematic. Application of liquid crystals.

UNIT-III - Solid state (9h)

Symmetry in crystals. Law of constancy of interfacial angles. The law of rationality of indices. Miller indices, Definition of lattice point, space lattice, unit cell. Bravais lattices and crystal systems. X-ray diffraction and crystal structure. Bragg's law and its derivation. Powder method. Defects in crystals-Stoichiometric and non-stoichiometric defects.

Unit IV - Phase Rule (9 h)

The Concept of phase, components, degrees of freedom. Gibbs phase rule. Phase diagram of one component system – water system, Study of Phase diagrams of Simple eutectic systems i) Pb-Ag system, desilverisation of lead ii) NaCl-Water system, Congruent and incongruent melting point-Definition and examples for systems having congruent and incongruent melting point, freezing mixtures.

Unit V Surface Chemistry (9 h)

Definition and classification of Colloids- Coagulation of colloids- Hardy-Schulze rule. Stability of colloids, Protection of Colloids, Gold number.
Adsorption - Physical and chemical adsorption, Freundlich and Langmuir adsorption isotherm, applications of adsorption.

III. List of Reference Books:

1) Solid State Chemistry and its applications by Anthony R. West
2) Text book of physical chemistry by K L Kapoor Vol.1
3) Text book of physical chemistry by S Glasstone
4) Advanced physical chemistry by Bahl and Tuli

SCIM GOVT. COLLEGE (A) TANUKU
Admitted Batch- 2024-25 AY
IV - SEMESTER
Course Code 9: Physical Chemistry-II practical
(States of Matter, Phase Rule & surface Chemistry) - (P)

Practical Credits: 1 2 hrs/week

Course outcomes:

At the end of the course, the student will be able to:

1) Use glassware, equipment and chemicals and follow experimental procedures in the laboratory
2) Apply concepts of surface chemistry in experiments.
3) Be familiar with the concepts & practical applications of Surface tension and viscosity of liquids.

Physical Chemistry Practical Syllabus:

1. Determination of surface tension of liquid by drop count method
2. Determination of surface tension of liquid by drop weight method
3. Determination of surface tension of mixture (liquid + detergent) using stalagmometer.
4. Determination of coefficient of viscosity of an organic liquid.
5. Determination of composition of a glycerol in glycerol + water mixture using viscometer.
6. Adsorption of acetic acid on animal charcoal, verification of Freundlich isotherm.

Co-curricular activities and Assessment Methods:

1) Continuous Evaluation: Monitoring the progress of student's learning
2) Class Tests, Worksheets and Quizzes
3) Presentations, Projects and Assignments and Group Discussions: Enhances critical thinking skills and personality
4) SEMESTER -End Examination: critical indicator of student's learning and teaching methods adopted by teachers throughout the SEMESTER .

List of reference books:

1) A Text Book of Quantitative Inorganic Analysis(3rdEdition) –A.I.Vogel
2) Web related references suggested by teacher.

SCIM GOVT. COLLEGE (A) TANUKU
Admitted Batch- 2024-25 AY
IV - SEMESTER
B.Sc Degree Examination Semester-IV
Course Code : 09
Paper : Physical Chemistry-II (States of Matter, Phase Rule & surface Chemistry)
Blue Print

Sl.No	Unit No.	Unit Name	Essay Questions	Short Questions	Total Questions
1.	**I**	Gaseous state	2	2	4
2.	**II**	Liquid State	2	1	3
3.	**III**	Solid state	2	2	4
4.	**IV**	Phase Rule	2	1	3
5.	**V**	Surface Chemistry	2	2	4
Total Questions			10	08	18

SCIM GOVT. COLLEGE (A) TANUKU
Admitted Batch- 2024-25 AY
B.Sc. Degree Examination Semester-IV
Course Code: 09
Paper: Physical Chemistry-II (States of Matter, Phase Rule & surface Chemistry)

MODEL QUESTION PAPER

Max. Marks: 60 Time: 3h

SECTION – A

Answer any FIVE from the following questions. **(5x4 = 20 M)**

1. Explain Andrew's isotherm of carbon dioxide.
2. Write a note on Joule – Thomson effect.
3. Write the differences between liquid crystal and solid/liquid.
4. Define lattice point and unit cell.
5. Explain Miller indices with example.
6. Write a note on Gold Number.
7. Write a short note on freezing mixtures.
8. Define and give the classification of Colloids.

SECTION – B

Answer any Five of the following questions. **(5x8 = 40M)**

9. State and explain the terms involved in Vander Waal's equation.

(or)

10. Write the Relationship between critical constants and Vander Waal's constants.
11. Explain Classification of liquid crystals and Write its applications.

(or)

12. Discuss Temperature variation of viscosity of liquids and comparison with that of gases.
13. Write an essay on Crystal defects.

(or)

14. Explain Bragg's law and its derivation.
15. Explain Pb-Ag system.

(or)

16. What is Phase Rule? Explain Phase diagram of one component System-Water System.
17. What is Adsorption? Write the differences between Physical and Chemical Adsorption.

(or)

18. Explain Freundlich and Langmuir adsorption Isotherm and Applications of Adsorption.

SCIM GOVT. COLLEGE (A) TANUKU
Admitted Batch- 2024-25 AY
IV - SEMESTER
Course Code 10: GENERAL AND PHYSICAL CHEMISTRY

Theory **Credits: 3** **3 hrs/week**

I. Course outcomes:

At the end of the SEMESTER the student will be able to:

1. Correlate and describe the stereochemical properties of organic compounds.
2. Explain the biological significance of various elements present in the human body.
3. Apply the concepts of ionic equilibrium for the qualitative and quantitative analysis.
4. Determine the order of a chemical reaction.
5. Describe the basic concepts of enzyme catalysis.

II. Syllabus:

UNIT-I Stereo chemistry of carbon compounds (9 h)

Molecular representations - Wedge, Fischer, Newman and Saw-Horse formulae.

Optical isomerism: Optical activity- wave nature of light, plane polarised light, optical rotation and specific rotation. Chiral molecules- definition and criteria (Symmetry elements)- Definition of enantiomers and diastereomers – Explanation of optical isomerism with examples- Glyceraldehyde, Lactic acid, Alanine, Tartaric acid, 2,3-dibromopentane.

Unit II Bioinorganic Chemistry (9 h)

Metal ions present in biological systems, classification of elements according to their action in biological system. Geochemical effect on the distribution of metals, Na / K- pump, carbonic anhydrase and carboxy peptidase. Excess and deficiency of some trace metals. Toxicity of metal ions (Hg, Pb, Cd and As), reasons for toxicity, Use of chelating agents in medicine, Cisplatin as an anti-cancer drug. Iron and its application in bio-systems, Haemoglobin-transfer of oxygen, Myoglobin-Storage and transfer of iron

UNIT III Ionic Equilibrium (9 h)

Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, *p*H scale, Concept of pK_a, Buffer solutions-Henderson's equation. Indicators-theories of acid – base Indicators, selection of Indicators, Common ion effect Solubility and solubility product of sparingly soluble salts – applications of solubility product principle.

Unit IV Chemical Kinetics-I: (9 h)

The concept of reaction rates.Effect of temperature, pressure, catalyst and other factors on reaction rates. Order and molecularity of a reaction, Derivation of integrated rate equations for zero, first and second order reactions (similar and different reactants). Half–life of a reaction.General methods for determination of order of a reaction.

Unit V Chemical Kinetics-II: (9 h)

Concept of activation energy and its calculation from Arrhenius equation. Theories of Reaction Rates: Collision theory and Activated Complex theory of bimolecular reactions. Comparison of the two theories (qualitative treatment only).

Enzyme catalysis- Specificity, factors affecting enzyme catalysis, Inhibitors and Lock & key model. Michaels- Menten equation- derivation, significance of Michaelis-Menten constant.

III. Reference books

1) Text book of physical chemistry by S Glasstone
2) Concise Inorganic Chemistry by J.D.Lee
3) Advanced physical chemistry by Gurudeep Raj
4) Advanced physical chemistry by Bahl and Tuli
5) Inorganic Chemistry by J.E.Huheey
6) Basic Inorganic Chemistry by Cotton and Wilkinson

SCIM GOVT. COLLEGE (A) TANUKU
Admitted Batch- 2024-25 AY
IV - SEMESTER
Course Code 10: PHYSICAL CHEMISTRY VOLUMETRIC ANALYSIS - (P)
Practical Credits: 1 2 hrs/week

I. Course outcomes:

At the end of the course, the student will be able to;
1. Use glassware, equipment and chemicals and follow experimental procedures in the laboratory
2. Understand and explain the volumetric analysis based on fundamental concepts learnt in ionic equilibria
3. Learn and identify the concepts of a standard solutions, primary and secondary standards
4. Facilitate the learner to make solutions of various molar concentrations.

II. Syllabus : Volumetric analysis:

1. Estimation of sodium hydroxide using standardised HCl solution.
2. Estimation of sodium carbonate and sodium hydroxide present in a mixture.
3. Determination of Fe (II) using $KMnO_4$ with oxalic acid as primary standard. (internal indicator method)
4. Determination of Fe (II) using $KmnO_4$ with oxalic acid as primary standard. (external indicator method)
5. Estimation of water of crystallization in Mohr's salt by titrating with KmnO4

III. Co-curricular activities and assessment methods :

1. Continuous Evaluation: Monitoring the progress of student's learning
2. Class Tests, Worksheets and Quizzes
3. Presentations, Projects and Assignments and Group Discussions: Enhances critical thinking skills and personality
4. SEMESTER -End Examination: critical indicator of student's learning and teaching methods adopted by teachers throughout the SEMESTER

VI. List of reference books:

1. A Text Book of Quantitative Inorganic Analysis(3rdEdition) –A.I.Vogel
2. Web related references suggested by teacher.

SCIM GOVT. COLLEGE (A) TANUKU
Admitted Batch- 2024-25 AY
IV - SEMESTER
B.Sc. Degree Examination Semester-IV
Course Code: 10
Paper-: General& Physical Chemistry
Blue Print

Sl.No	Unit No.	Unit Name	Essay Questions	Short Questions	Total Questions
1.	**I**	Stereo chemistry of carbon compounds	2	2	4
2.	**II**	Bio inorganic Chemistry	2	2	4
3.	**III**	Ionic equilibrium	2	1	3
4.	**IV**	Chemical Kinetics-I	2	2	4
5.	**V**	Chemical Kinetics-II	2	1	3
Total Questions			10	8	18

SCIM GOVT. COLLEGE (A) TANUKU
Admitted Batch- 2024-25 AY
B.Sc. Degree Examination Semester-IV
Course Code: 10
Paper: General & Physical Chemistry
MODEL QUESTION PAPER

Max. Marks: 60 Time: 3h

SECTION – A

Answer any FIVE from the following questions. **(5x4 = 20 M)**

1. Define enantiomers and diastereomers.
2. Write about Optical rotation and specific rotation.
3. Write notes on Haemoglobin.
4. Explain Cis-platin as anti-cancer drug.
5. Write a note on selection of Indicators.
6. Explain Order and molecularity of a reaction.
7. Derive integrated rate equation for Zero order reaction.
8. Define enzyme catalysis and what are the factors affecting it?

SECTION – B

Answer any Five of the following questions. (5x8 = 40M)

9. What is optical isomerism? Discuss on optical isomerism with examples.

(Or)

10. Explain E, Z-configuration with example.
11. Discuss about toxicity of metal ions (Hg, Pb) and write reasons for toxicity.

Or

12. Discuss the role of Iron and its application in bio-systems.
13. Define ionization constant and ionic product of water with example Give the applications of ionization constant.

(Or)

14. Explain solubility product and common ion effect with applications.
15. Explain general methods for determination of order of reaction.

(Or)

16. Define First Order reaction with examples? Derive integrated rate equation for first order reaction.
17. Discuss on Collision theory and Activated Complex theory of reaction rates.

(Or)

18. Derive Michaels- Menten equation.

SCIM GOVT. COLLEGE (A) TANUKU
Admitted Batch- 2024-25 AY
IV - SEMESTER
COURSE CODE 11: NITROGEN CONTAINING ORGANIC COMPOUNDS & SPECTROSCOPY

Theory Credits: 3 3hrs/week

I. Course outcomes:

At the end of the SEMESTER the student will be able to:
1. Distinguish primary secondary and teritiary amines and their properties.
2. Describe the preparation and properties of amino acids.
3. Explain the reactivity of nitro hydrocarbons.
4. Discuss heterocyclic compounds with N, O and S.
5. Apply the concepts of UV and IR to ascertain the functional group in an organic compound.

II. Syllabus:

Unit I Amines: (9 h)
Classification, chirality in amines (pyramidal inversion), preparations – Gabriel synthesis, Hoffmann- Bromamide reaction (with mechanism), reduction of amides and Schmidt reaction. Distinction between Primary, secondary and tertiary amines using Hinsberg's method and nitrous acid. Discussion of the following reactions with emphasis on the mechanistic pathway: Carbylamine reaction, Hoffmann's exhaustive methylation, Hofmann and Cope elimination.
Diazonium Salts: Preparation and synthetic applications of diazonium salts including preparation of arenes, haloarenes, phenols, cyano and nitro compounds. Coupling reactions of diazonium salts (preparation of azo dyes).

UNIT- II Amino acids (9 h)
Definition and classification of Amino acids into alpha, beta, and gamma amino acids.Natural and essential amino acids - definition and examples, classification of alpha amino acids into acidic, basic and neutral amino acids with examples. Methods of synthesis: a) from halogenated carboxylic acid, b) Gabriel Phthalimide synthesis c) Strecker's synthesis
Physical properties: Zwitter ion structure - salt like character - solubility, melting points, amphoteric character, definition of isoelectric point. Chemical properties: General reactions due to amino and carboxyl groups - lactams from gamma and delta amino acids by heating- peptide bond (amide linkage). Structure and nomenclature of peptides and proteins.

UNIT- III Nitro hydrocarbons (9h)
Nomenclature and classification, structure -Tautomerism of nitroalkanes leading to acid and keto form, Preparation of Nitroalkanes, reactivity - halogenation, reaction with HONO (Nitrous acid), Nef reaction and Mannich reaction leading to Micheal addition and reduction.

Unit IV Heterocyclic Compounds (9 h)
Introduction and definition: Simple five membered ring compounds with one hetero atom Ex. Furan, Thiophene and Pyrrole - Aromatic character – Preparation from 1, 4, -dicarbonyl compounds, Paul-Knorr synthesis. Properties: Acidic character of pyrrole - electrophillic substitution at 2 or 5 position, Halogenation, Nitration and Sulphonation - Diels Alder reaction in furan. Pyridine – synthesis - Aromaticity -Basicity - Comparison with pyrrole- one method of preparation and properties - Reactivity towards Nucleophilic substitution reaction.

Unit V UV-Visible & IR Spectroscopy (9 h)

Selection rules for electronic spectra, types of electronic transitions in molecules, concept of chromophore and auxochrome, Beer-Lamberts Law, effect of conjugation- Woodward Fischer rules for calculating λ_{max} of conjugated dienes and α, β unsaturated compounds. Infrared spectroscopy and types of molecular vibrations and fingerprint region. IR spectra of alkanes, alkenes and simple alcohols (inter and intra molecular hydrogen bonding), aldehydes, ketones, carboxylic acids and their derivatives (effect of substitution on >C=O stretching absorptions).

III. List of Reference Books

1) A Text Book of Organic Chemistry by Bahl and Arunbahl
2) A Text Book of Organic chemistry by I L FinarVol I
3) Organic chemistry by Bruice
4) Organic chemistry by Clayden
5) Spectroscopy by William Kemp
6) Spectroscopy by Pavia
7) Organic Spectroscopy by J. R. Dyer
8) Elementary organic spectroscopy by Y.R. Sharma
9) Spectroscopy by P.S.Kalsi
10) Spectrometric Identification of Organic Compounds by Robert M Silverstein, Francis X Webster

SCIM GOVT. COLLEGE (A) TANUKU
Admitted Batch- 2024-25 AY
IV - SEMESTER
Course Code 11: ORGANIC PREPARATIONS AND IR SPECTRAL ANALYSIS
Practical Credits: 1 2 hrs/week

I.Course outcomes:

On completion of the course, the student will be able to:
1) Use glassware, equipment and chemicals and follow experimental procedures in the laboratory
2) Calculate limiting reagent, theoretical yield, and percent yield
3) Engage in safe laboratory practices by handling laboratory glassware, equipment, and chemical reagents appropriately
4) Dispose of chemicals in a safe and responsible manner
5) Perform common laboratory techniques including reflux, distillation, recrystallization, vacuum filtration.
6) Create and carry out work up and separation procedures.

Syllabus:

A. Organic preparations: 40M

1) Acetylation of one of the following compounds: amines (aniline, o-, m-, ptoluidines and o-, m-, p-anisidine)
   a. Using conventional method.
   b. Using green approach
2) Benzoylation of one of the following amines (aniline, o-, m-, p- toluidines and o-, m-, p-anisidine)
3) Nitration of any one of the following: Acetanilide/nitrobenzene by conventional method

B. IR Spectral Analysis 10M

IR Spectral Analysis of the following functional groups with examples a) Hydroxyl groups b) Carbonyl groups c) Amino groups d) Aromatic groups

Co-curricular activities and assessment methods:

1. Continuous Evaluation: Monitoring the progress of student's learning
2. Class Tests, Worksheets and Quizzes
3. Presentations, Projects and Assignments and Group Discussions: Enhances critical thinking skills and personality
4. SEMESTER -End Examination: critical indicator of student's learning and teaching methods adopted by teachers throughout the SEMESTER

List of reference books:

1. Vogel A.I .Practical Organic Chemistry, Longman Group Ltd.
2. Bansal R.K. Laboratory Manual of Organic Chemistry, Wiley-Eastern.
3. Ahluwalia V. K. and Agarwal R. Comprehensive Practical Organic Chemistry, University press.
4. Webrelated references suggested by teacher.

SCIM GOVT. COLLEGE (A) TANUKU
Admitted Batch- 2024-25 AY
IV - SEMESTER
B.Sc Degree Examination Semester-IV
Course Code : 11
Paper- : Nitrogen containing Organic Compounds & Spectroscopy
Blue Print

Sl.No	Unit No.	Unit Name	Essay Questions	Short Questions	Total Questions
1.	**I**	Amines	2	2	4
2.	**II**	Amino acids	2	2	4
3.	**III**	Nitro hydrocarbons	2	1	3
4.	**IV**	Heterocyclic Compounds	2	2	4
5.	**V**	UV-Visible & IR Spectroscopy	2	1	3
Total Questions			10	8	18

B.Sc Degree Examination Semester-IV

Course Code: 11

Paper: Nitrogen Containing Organic Compounds & Spectroscopy

MODEL QUESTION PAPER

Max. Marks:60 **Time :3h**

SECTION – A

Answer any FIVE from the following questions. **(5x4 = 20 M)**

1. Give Schmidt and Carbylamine reactions with suitable examples.
2. Write any four synthetic applications of diazonium salts.
3. Define amino acids and give the classification based on nature with example
4. Discuss the structure and nomenclature of peptides.
5. Explain tautomerism of nitroalkanes.
6. Give the preparative method of heterocyclic compounds from Paul-Knorr synthesis.
7. Explain the basic character of Pyridine.
8. Discuss on types of electronic transitions in molecules.

SECTION – B

Answer any Five of the following questions. (5x8 = 40M)

9. How to separate primary, secondary and tertiary amines using Hinsberg's method? Explain it.

(Or)

10. Explain on the following:
    (i) Hoffmann-Bromamide reaction mechanism
    (ii) Cope elimination
11. How to prepare amino acids from (i) Gabriel phthalimide and (ii) Strecker's synthesis

(Or)

12. Explain on the following:
    (i) Zwitter ion
    (ii) Isoelectric point
    (iii) Formation of lactams
13. Write any one preparative method of nitro alkanes and discuss on reactivity of halogenation and reaction with nitrous acid.

(Or)

14. Write on the following:
    (i)Nef reaction
    (ii) Mannich reaction
    (iii) Michael addition
15. Discuss on aromaticity of Furan, Thiophene and Pyrrole.

(Or)

16. Write on the following:
    (i) Diels–Alder reaction (ii) Halogenation
    (iii) Nitration
17. Explain Woodward Fischer rules for calculating λ_{max} of conjugated dienes.

(Or)

18. Write on the following:
    (i) Types of molecular vibrations
    (ii) IR spectra of Aldehydes
