

Sri Venkateswara University, Tirupati

**Syllabus for Chemistry (Major) in consonance with Curriculum frame work
(W.E.F. AY-2026-27)**

COURSE STRUCTURE (for Semesters IV)

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
	IV	8	Organic Chemistry-III (Nitrogen Containing Organic Compounds & Biomolecules)	3	3
			Organic Chemistry-III Practical	2	1
		9	Physical Chemistry – III (Ionic equilibrium and Thermodynamics)	3	3
			Qualitative Analysis of Inorganic Mixture	2	1
		10	Applied and Physical Chemistry	3	3
			Applied and Physical Chemistry Practical	2	1


(BOS Chairman)
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SEMESTER-IV

COURSE 8: ORGANIC CHEMISTRY-III

Theory

Credits: 3

3 hrs/week

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I. LEARNING OBJECTIVES:

1. To understand classification, synthesis, and reactions of amines and nitro hydrocarbons.
2. To interpret the chemistry and reactivity of heterocyclic compounds and their aromaticity.
3. To understand structural details and interconversions of carbohydrates.
4. To classify amino acids and explain their synthesis, structure, and properties.

II. COURSE OUTCOMES:

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

1. Describe the synthesis and chemical behaviour of amines and nitro hydrocarbons.
2. Understand the synthetic applications of diazonium salts.
3. Illustrate aromaticity and reactivity patterns in five- and six-membered heterocycles.
4. Explain the structural features, stereochemistry, and reactivity of carbohydrates.
5. Classify and synthesize amino acids and explain their biochemical behaviour.

III. SYLLABUS:

UNIT-1: AMINES

(9 h)

Definition, Classification and Basicity of amines, Preparation- Gabriel synthesis and reduction of amides. Differentiation of Primary, secondary and tertiary amines using Hinsberg's method. Hoffmann's exhaustive methylation with mechanism, Hoffmann elimination with mechanism.

Diazonium Salts: Preparation and synthetic applications of diazonium salts. Preparation of azo dyes.

UNIT-2: NITRO HYDROCARBONS

(9 h)

Definition, Classification, Tautomerism of nitroalkanes leading to acid and keto form, Preparation of Nitroalkanes-from alkyl halides, oxidation of amines and oximes, Reactivity - halogenation, nitration, Nef reaction and Mannich reaction.

UNIT-3: HETEROCYCLIC COMPOUNDS

(9 h)

Definition, Classification and nomenclature of heterocyclic compounds with one hetero atom,

Pyrrole, Furan, and Thiophene: Aromatic character, Preparation from 1,4-dicarbonyl compounds (Paul-Knorr synthesis). Electrophilic substitution reactions- Nitration, Sulphonation, Acylation and Formylation, Diels-Alder reaction in furan.

Pyridine: Basicity, Aromaticity, Synthesis from acetylene, Chichibabin Reaction.

UNIT-4: CARBOHYDRATES

(9 h)

Definition, classification of carbohydrates, Structural elucidation of glucose, epimers and anomers, mutarotation, Haworth projection and conformational structure of glucose, Interconversions of aldoses and ketoses: Killiani-Fischer synthesis, Ruff degradation.

UNIT- 5: 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. Synthesis of amino acids-Strecker's synthesis and Gabriel-Phthalimide synthesis. Zwitter ion structure, Iso-electric point, Peptide bond.

IV. REFERENCES:

1. R.N. Morrison, R.N. Boyd, Organic Chemistry, Pearson Education, 7th edition, 2010.
2. P.Y. Bruice, Organic Chemistry, 8th Edition, Pearson, 2017.
3. V.K. Ahluwalia, P. Bhagat, R. Aggarwal, R. Chandra, Intermediate for Organic Synthesis, I.K. International. 2005.
4. F.A. Carey and R.J. Sundberg, Advanced Organic Chemistry, Springer, 2008.
5. T.L. Gilchrist, Heterocyclic Chemistry, Pearson Education, 1997.
6. I.L. Finar, Organic Chemistry, Vols. 1 & 2, Pearson Education, 2002.
7. O.P. Agarwal, Chemistry of Organic Natural Products, Vols. 1&2, Goel Pubs, 2015.

V. PROPOSED ACTIVITIES:

1. Group debate on tautomerism and worksheets on named reactions.
2. Create Haworth projection models using paper/polystyrene.
3. Worksheet on epimer/anomer identification.

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.

SEMESTER-IV

COURSE 8: ORGANIC CHEMISTRY-III PRACTICAL

Practical

Credits: 1

2 hrs/week

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I. LEARNING OBJECTIVES:

1. To understand the principles and mechanisms involved in substitution reactions.
2. To apply laboratory safety protocols and precise techniques during organic synthesis.
3. To identify functional groups in amino acids using qualitative colour reactions such as the Ninhydrin and Xanthoproteic tests.
4. To detect simple carbohydrates by qualitative tests like Molisch's, Benedict's, Barfoed's, and Seliwanoff's tests.

II. COURSE OUTCOMES:

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

1. Perform acylation, benzylation and halogenation reactions.
2. Demonstrate skill in safe and accurate laboratory practices for organic compound synthesis.
3. Evaluate the differences between monosaccharides like glucose and fructose.
4. Identify functional groups in amino acids through characteristic colour reactions.

III. SYLLABUS:

1. Benzylation of aniline.
2. Acetylation of aniline.
3. Bromination of aniline (Synthesis of p-Bromoaniline from Aniline).
4. Identification of Functional Groups in Amino Acids by Ninhydrin test & Xanthoproteic test.
5. Qualitative tests for Glucose/Fructose-Molisch's, Benedict's, Barfoed's, and Seliwanoff's tests.
6. Estimation of Glucose by using Fehling's solution.

IV. REFERENCES:

1. B.S. Furniss, A.J. Hannaford, P.W.G. Smith, A.R. Tatchell, Vogel's Textbook of Practical Organic Chemistry, Pearson, 2012.
2. V.K. Ahluwalia, R. Aggarwal, Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis, University Press, 2004.
3. D.L. Pavia, G.M. Lampman, G.S. Kriz, R.G. Engel, Introduction to Organic Laboratory Techniques, Cengage Learning, 2014.

V. CO-CURRICULAR ACTIVITIES AND ASSESSMENT METHODS:

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

4- Year UG Honours, Major
Syllabus
(2026-27)
Semester-IV

Model Question Paper

Time : 3hrs

Marks:75

Part-A

Answer any Five Questions. Each Question carries 3 Marks.

5x3=15

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

Answer the following questions. Each question carries 12 Marks

5x12=60

11. a) Unit-I
(Or)
b) Unit-I

12. a) Unit-II
(Or)
b) Unit-II

13. a) Unit-III
(Or)
b) Unit-III

14. a) Unit-IV
(Or)
b) Unit-IV

15. a) Unit-V
(Or)
b) Unit-V