Lecture Plan

Name of the College: Government College of Arts, Science and Commerce. Sanquelim - Goa

Name of Faculty: ASHOK MAHADEV CHODANKAR	**Subject:** CHEMISTRY	
Paper code: CHC 107	**Program: BSc**	**Division: -**
Academic year: 2024 - 2025	**Semester: V**	**Total Lectures: 30**

Course Objectives:

To study heterocyclic compounds and bicyclic heterocycles with examples.

- **To learn classification with examples of oxygen, sulphur and nitrogen containing heterocycles (up to 6 membered).**
- **To understand structure, resonance, stability and reactivity of furan, pyrrole, thiophene, pyridine, indole, quinoline and isoquinoline and also learn about their industrial source and preparation methods.**
- **To study structure elucidation of Vitamin A, Vitamin C , Thyroxine and Adrenaline and also learn their synthesis from β-ionone, xylose, tyrosine and catechol respectively.**
- **To learn classification of dyes with one example and structure of each class.**
- **To understand reasons for colour of some molecules.**
- **To learn synthesis and understand chemistry of phenolphthalein, congo-red, crystal violet and methyl orange.**

PRACTICAL COURSE OBJECTIVES

- **To understand theoretical concepts required for experiments and develop hands on experience with reference to basic laboratory techniques required for organic preparations, estimations and identification and separation of organic binary mixtures.**
- **To learn the interpretation of Infra-Red and proton NMR spectra by applying the concepts studied in theory.**

Course Outcome:
Define and classify oxygen, sulphur and nitrogen containing heterocyclic compounds with examples.
• Explain structure, resonance, stability and reactivity of furan, pyrrole, thiophene, pyridine, indole, quinoline and isoquinoline and give their industrial source and preparation methods.
• Explain structure elucidation of vitamin a , vitamin c , thyroxine and adrenaline and also give their synthesis from β-ionone, xylose, tyrosine and catechol respectively.
• Classify dyes, giving one example and structure of each class.
• Explain reasons for colour of some molecules.
• Give synthesis and explain the chemistry of phenolphthalein, congo-red, crystal violet and methyl orange.

Practical
At the end of the course students will be able to
• Discuss the theory behind experiments.
• Understand stoichiometric requirements during organic preparations.
• Develop skills of common laboratory techniques including reflux, recrystallisation, recording of melting point, distillation, titration and chemical analysis.
• Identify the separation technique for binary mixture separation and perform chemical nature analysis.
• Perform calculations for quantitative analysis.
• To interpret infra-red and proton NMR spectra of simple organic compounds.

Student Learning Outcome:
Course Outcome:
At the end of the course students will be able to
Define and classify oxygen, sulphur and nitrogen containing heterocyclic compounds with examples.
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give their synthesis from β-ionone, xylose, tyrosine and catechol respectively.
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Month	Lecture From	Lecture To	No. of lectures allotted	Topic, Subtopic to be covered	Exercise/ Assignment	ICT Tools	Reference books
01 AUGUST 2024 TO 03 AUGUST 2024	10.45	11.45	01	Definition of heterocyclic compounds: Organic compounds containing oxygen, sulphur, nitrogen. Classification with examples for three, four, five and six membered heterocycles		SMART BOARD	1. I.L.Finar, Organic Chemistry Vols I and II, Orient Longman. 2. Morrison and Boyd, Organic Chemistry; 6th Edn. Prentice Hall India.
	9.45	10.45	01	Structure, resonance, stability and industrial source of furan, pyrrole, thiophene and pyridine			
5 AUGUST TO 10	12.15	4.15	04	Organic Estimations b) Acid + Ester			

AUGUST 2024	12.15	4.15	04	Organic Estimations b) Acid + Ester			3. Francis Carey, Organic Chemistry, 10th Edition. 4. Paula Yurkanis Bruice, Organic Chemistry; 3rd Edn. Pearson Education Asia.
	10.45	11.45	01	Preparation of furan, pyrrole and thiophene using Paal Knorr Synthesis. Reactivity of furan, pyrrole and thiophene:			
	09.45	10.45	01	Electrophilic substitution at 2/5 position.			
12 AUGUST TO 17 AUGUST 2024	12.15	4.15	04	Organic Estimations a) Acid+ Amide			
	12.15	4.15	04	Organic Estimations a) Acid+ Amide			
	HOLIDAY						
	09.45	10.45	01	Reactivity of pyridine: Electrophilic substitution at 3 position, Nucleophilic substitution at 2 and 4 position.			
19 AUGUST TO 24 AUGUST 2024	12.15	4.15	04	c) Estimation of the number of acetyl groups in an acetyl ester. (Triacetyl glycerol, Hexaacetyl mannitol or Pentaacetyl glucose)			
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	10.45	11.45	01	Preparation of pyridine using Hantzsch synthesis. Structure, resonance, stability and industrial source of indole, quinoline, isoquinoline			
	09.45	10.45	01	Preparation of indole using Fischer indole synthesis. Reactivity of			

				Indole: Electrophilic substitution at 3 position.			
26 AUGUST TO 31 AUGUST 2024	12.15	4.15	04	Synthesis of dyes b) Picric acid			
	12.15	4.15	04	Synthesis of dyes b) Picric acid			
	10.45	11.45	01	Skraup synthesis of quinoline and Bischler Napieralski synthesis of isoquinoline.			
	09.45	10.45	01	Reactivity of quinoline and isoquinoline: Electrophilic substitution at 5/8 position,			
2 SEPT TO 5 SEPT 2024	12.15	4.15	04	Synthesis of dyes a) Diazoaminobenzene			
	12.15	4.15	04	Synthesis of dyes a) Diazoaminobenzene			
	10.45	11.45	01	Nucleophilic substitution at 2 and 4 position. Oxidation and Reduction of quinoline and Isoquinoline.			
13 SEPT TO 14 SEPT 2024	09.45	10.45	01	Vitamins and Hormones Structure elucidation of Vitamin A			
16 SEPT TO 21 SEPT 2024	12.15	4.15	04	Organic Preparations Synthesis, yield, recrystallisation and Melting Point. v) Benzoin to benzilic acid			
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				v) Benzoin to benzilic acid
	10.45	11.45	01	Vitamins and Hormones Structure elucidation of Vitamin C
	09.45	10.45	01	Vitamins and Hormones Structure elucidation of Thyroxine
	12.15	4.15	04	Organic Preparations Synthesis, yield, recrystallisation and Melting Point. Benzamide to m-nitrobenzoic acid
	12.15	4.15	04	Organic Preparations Synthesis, yield, recrystallisation and Melting Point. Benzamide to m-nitrobenzoic acid
	10.45	11.45	01	Vitamins and Hormones Structure elucidation of Adrenaline.
23 SEPT TO 28 SEPT 2024	09.45	10.45	01	Vitamins and Hormones, Synthesis :Vitamin A from β-ionone ,Vitamin C from xylose
	12.15	4.15	04	REPEATATION
	12.15	4.15	04	REPEATATION
30 SEPT TO 5 OCT 2024	10.45	11.45	01	Vitamins and Hormones Synthesis :Adrenaline from Catechol and thyroxine from tyrosine.
	12.15	4.15	04	REPEATATION
	12.15	4.15	04	REPEATATION
	10.45	11.45	01	Dyes Classification of dyes: Acidic, basic, azo, reactive, with one example and structure of each class.
7 OCT TO 12 OCT 2024	09.45	10.45	01	Dyes Classification of dyes: , Vat, mordant, direct, disperse with

				one example and structure of each class.			
	12.15	4.15	04	REPEATATION			
	12.15	4.15	04	REPEATATION			
	10.45	11.45	01	Dyes Reasons for colour of some molecules: Resonance effect in p-nitroaniline and nitrobenzene, conjugation effect in β-carotene and graphite.			
14 OCT TO 19 OCT 2024	09.45	10.45	01	Synthesis and chemistry of phenolphthalein, congo-red, crystal violet, methyl orange.			
21 OCT AND 22 OCT 2024				REPEATATION			

Assessment Rubrics

Component	**Max Marks**
ISA 1	----------
ISA 2	(10) 27/09/2024
Practical	(50) AFTER SEMESTER END EXAM
Project	----------
Semester End Exam	(80) FROM 28/10/2024