

# ARSD College, University of Delhi

## Model Course Handout/Lesson Plan

Course Name : B.Sc. (Hons) chemistry						
Semester	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
III	32171302 CHEMISTRY -CVI-: Organic Chemistry II	<b>Halogenated Hydrocarbon and Oxygen containing functional Groups</b>	2			2
Teacher/Instructor(s)		Dr. Neha Bhardwaj				
Session		2022-23				

Course Objective: The core course Organic Chemistry II is designed in a manner that gives a better understanding of the organic functional groups, which include halogenated hydrocarbons and oxygen containing functional groups and their reactivity patterns. The detailed reactions mechanistic pathways for each functional group will be discussed to unravel the spectrum of organic chemistry and the extent of organic transformations.

Course Learning Outcomes: By the end of this course, students will be able to:

- Understand preparation, properties and reactions of haloalkanes, haloarenes and oxygen containing functional groups.
- Use the synthetic chemistry learnt in this course to do functional group transformations.
- To propose plausible mechanisms for any relevant reaction.

Lesson Plan:

Unit No.	Learning Objective	Lecture No.	Topics to be covered
1.	<b>Chemistry of Halogenated Hydrocarbons</b>	1-2	Alkyl halides: Methods of preparation and properties, nucleophilic substitution reactions
		3-4	S <sub>N</sub> 1, S <sub>N</sub> 2 and S <sub>N</sub> i mechanisms with stereochemical aspects and effect of solvent
		5-6	nucleophilic substitution vs. elimination.

		7-8	Aryl halides: Preparation (including preparation from diazonium salts) and properties
		9-10	nucleophilic aromatic substitution; $S_NAr$
		11-12	Benzyne mechanism.
		13-14	Relative reactivity of alkyl, allyl, benzyl, vinyl and aryl halides towards nucleophilic substitution reactions.
		15-16	Organometallic compounds of Mg (Grignard reagent) – Use in synthesis of organic compounds.
2.	<b>Alcohol, Phenol, Ether and Epoxides</b>	17-18	Alcohols: preparation, properties and relative reactivity of 1°, 2°, 3° alcohols
		19-20	Bouveault–Blanc Reduction
		21-22	Oxidation of diols by periodic acid and lead tetraacetate
		23-24	Pinacol-Pinacolone rearrangement. Phenols: Preparation and properties
		25-26	Acidity and affecting factors, Ring substitution reactions, Reimer–Tiemann
		27-28	Kolbe’s–Schmidt Reactions, Fries and Claisen rearrangements and their mechanism.
		29-30	Ethers and Epoxides: Preparation and reactions with acids.
31-32	Reactions of epoxides with alcohols, ammonia and $LiAlH_4$ .		

Evaluation Scheme:

No.	Component	Duration	Marks
1.	Internal Assessment		25
	• Quiz		
	• Class Test		
	• Attendance		
	• Assignment		
2.	End Semester Examination	3 hr	75

Details of the Course		
Unit	Contents	Contact Hours
1	Review of thermodynamics and the laws of thermodynamics, important principles and definitions of thermochemistry, concept of standard state	16

<b>Chemistry of Halogenated Hydrocarbons</b>	and standard enthalpies of formations, integral and differential enthalpies of solution and dilution, calculation of bond energy, bond dissociation energy and resonance energy from thermochemical data, variation of enthalpy of a reaction with temperature – Kirchhoff's equation., statement of third law of thermodynamics and calculation of absolute entropies of substances.	
<b>2 Alcohol, Phenol, Ether and Epoxides</b>	Alcohols: preparation, properties and relative reactivity of 1°, 2°, 3° alcohols, Bouveault-Blanc Reduction; Oxidation of diols by periodic acid and lead tetraacetate, Pinacol-Pinacolone rearrangement. Phenols: Preparation and properties; Acidity and affecting factors, Ring substitution reactions, Reimer-Tiemann and Kolbe's-Schmidt Reactions, Fries and Claisen rearrangements and their mechanism. Ethers and Epoxides: Preparation and reactions with acids. Reactions of epoxides with alcohols, ammonia and LiAlH <sub>4</sub> .	16
	Total	32
Suggested Books:		
Sl. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
-1	Morrison, R. N.; Boyd, R. N. <b>Organic Chemistry</b> , Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).	(2004)
2	Finar, I. L. <b>Organic Chemistry</b> (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).	(2010)
3	Ahluwalia, V.K.; Bhagat, P.; Aggarwal, R.; Chandra, R. (2005), <b>Intermediate for Organic Synthesis</b> , I.K.International.	(2005)
4	Solomons, T. W. G.; Fryhle, C. B. ; Snyder, S. A. (2016), <b>Organic Chemistry</b> , 12 <sup>th</sup> Edition, Wiley	(2016)
5	Chandra, R. ; Singh, S.; Singh, A. <b>Organic reactions and their nomenclature</b> , Arcler Press.	(2019)
Mode of Evaluation:	Internal Assessment / End Semester Exam	

Progress Report:

Unit No.	Learning Objective	Lecture Date	Topics to be covered
1.	<b>Chemistry of Halogenated Hydrocarbons</b>	30-09-22	Alkyl halides: Methods of preparation and properties, nucleophilic substitution reactions
			S <sub>N</sub> 1, S <sub>N</sub> 2 and S <sub>N</sub> i mechanisms with stereochemical aspects and effect of solvent
			nucleophilic substitution vs. elimination.
			Aryl halides: Preparation (including preparation from diazonium salts) and properties
			nucleophilic aromatic substitution; S <sub>N</sub> Ar
			Benzyne mechanism.
			Relative reactivity of alkyl, allyl, benzyl, vinyl and aryl halides towards nucleophilic substitution reactions.
			Organometallic compounds of Mg (Grignard reagent) – Use in synthesis of organic compounds.
2.	<b>Alcohol, Phenol, Ether and Epoxides</b>		Alcohols: preparation, properties and relative reactivity of 1°, 2°, 3° alcohols
			Bouveault–Blanc Reduction
			Oxidation of diols by periodic acid and lead tetraacetate
			Pinacol-Pinacolone rearrangement. Phenols: Preparation and properties
			Acidity and affecting factors, Ring substitution reactions, Reimer–Tiemann
			Kolbe’s–Schmidt Reactions, Fries and Claisen rearrangements and their mechanism.
			Ethers and Epoxides: Preparation and reactions with acids.
			Reactions of epoxides with alcohols, ammonia and LiAlH <sub>4</sub> .