Govt. T. R. S. (Autonomous) College Rewa (M.P.)

Department of Chemistry

Syllabus for B.Sc. Chemistry

(CBCS & NEP 2020)

Session 2022-23

Part A - Introduction			
Program: UG (Diploma)	**Class: B.Sc. Chemistry**	**Semester: IV**	**Session: 2022-23**
Subject: Chemistry			

1	**Course code**	**CHCT-04**	
2	**Course title**	**ORGANIC CHEMISTRY-II**	
3	**Course type**	**Major/Minor**	
4	**Pre-requisite (if any)**	**To study this course, a student must have had the subject Chemistry in Certificate.**	
5	**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 path ways for each functional group will be discussed to unravel the spectrum of organic chemistry and the extent of organic transformations.	
6	**Course Learning Outcomes (CLO)**	**On completion of the course, the student 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.	
7	**Credit Value**	**4**	
8	**Total Marks**	**Max. Marks (40+60): CCE+ESE**	**Min. Passing Marks: 35**

Part B – Content of the course		
Total No. of Lectures-Tutorials-Practical (4 hours per week): **L-T-P:60-0-00**		
Unit	**Topic**	**No. of Lectures**
1	**Chemistry of Halogenated Hydrocarbons:** ***Alkyl halides****:* Methods of preparation, nucleophilic substitution reactions – SN1, SN2 and SNi mechanisms with stereochemical aspects and effect of solvent etc.; nucleophilic substitution vs. elimination. ***Aryl halides****:* Preparation, including preparation from diazonium salts. nucleophilic aromatic substitution; SNAr, Benzyne mechanism. Relative reactivity of alkyl, allyl/benzyl, vinyl and aryl halides towards nucleophilic substitution reactions. Organometallic compounds of Mg and Li and their use in synthesis.	**15**
2	**Alcohols, Phenols, Ethers and Epoxides** ***Alcohols:***preparation, properties and relative reactivity of 1°, 2°, 3° alcohols, Bouvaelt-Blanc Reduction; Preparation and properties of glycols: Oxidation by periodic acid and lead tetraacetate, Pinacol-Pinacolone rearrangement. ***Phenols:***Preparation and properties; Acidity and factors effecting it, Ring substitution reactions, Reimer–Tiemann and Kolbe's–Schmidt Reactions, Fries and Claisen rearrangements with mechanism. ***Ethers and Epoxides:***Preparation and reactions with acids. Reactions of epoxides with alcohols, ammonia derivatives and $LiAlH_4$	**15**
3	**CarbonylCompounds** Structure, reactivity and preparation; Nucleophilic additions, Nucleophilic addition-elimination reactions with ammonia derivatives with mechanism; Mechanisms of Aldol and Benzoin condensation, Knoevenagel condensation, Claisen-Schmidt, Perkin, Cannizzaro and	**10**

	Wittig reaction, Beckmann and Benzil-Benzilic acid rearrangements, haloform reaction and Baeyer Villiger oxidation, α-substitution reactions, oxidations and reductions (Clemmensen, Wolff-Kishner, $LiAlH_4$, $NaBH_4$, MPV, PDC and PGC); Addition reactions of unsaturated carbonyl compounds: Michael addition. ***Active methylene compounds:*** Keto-enol tautomerism. Preparation and synthetic applications of diethyl malonate and ethyl acetoacetate.	
4	**Carboxylicacidsandtheirderivatives** ***Preparation, physical properties and reactions of monocarboxylic acids:*** Typical reactions of dicarboxylic acids, hydroxy acids and unsaturated acids: succinic/phthalic, lactic, malic, tartaric, citric, maleic and fumaric acids; Preparation and reactions of acid chlorides, anhydrides, esters and amides; Comparative study of nucleophilic substitution at acyl group -Mechanism of acidic and alkaline hydrolysis of esters, Claisen condensation, Dieckmann and Reformatsky reactions, Hofmannbromamide degradation and Curtius rearrangement.	**10**
5	**Sulphur containing compounds:** Preparation and reactions of thiols, thioethers and sulphonic acids.	**10**

Part C – Learning Resources

Text Books, Reference Books, Other resources

Suggested Reading:

1 Solomons, T.W G., Fryhle, B. Craig. *Organic Chemistry*, John Wiley & Sons, Inc (2009).

2 McMurry, J.E. *Fundamentals of Organic Chemistry*, Seventh edition Cengage Learning, 2013.

3 P Sykes, *A Guide Book to Mechanism in Organic Chemistry*, 6th Edition (1997), Orient Longman, New Delhi.

4 Morrison R. T. and Boyd R. N. Organic Chemistry, Sixth Edition Prentice Hall India, 2003.

Suggested equivalent online:

Keywords:

Alcohols, Phenols, Ethers and Epoxides**,** thiols, thioethers and sulphonic acids, $LiAlH_4$, $NaBH_4$, MPV, PDC and PGC.

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Part A - Introduction			
Program: UG (Diploma)	**Class: B.Sc. Chemistry**	**Semester: IV**	**Session: 2022-23**
Subject: Chemistry			

1	**Course code**	**CHCP-04**	
2	**Course title**	**ORGANIC CHEMISTRY II (PRACTICAL)**	
3	**Course type**	**Major/Minor**	
4	**Pre-requisite (if any)**	**To study this course, a student must have had the subject Chemistry in Certificate.**	
5	**Course Objective**	• To develop interest to identify different functional group. • To develop efficiency in working technique regarding experiment.	
6	**Course Learning Outcomes (CLO)**	**By the end of the course, students will be able to:** • Identify the different organic compounds by experiment. • Perform organic reactions in laboratory. • Explore oxidation and reduction process.	
7	**Credit Value**	**2**	
8	**Total Marks**	**Max. Marks (40+60): (CCE+ESE)**	**Min. Passing Marks: 35**

Part B – Content of the course

Total No. of Lectures-Tutorials-Practical (4 hours per week):

L-T-P: 00-0-60

Unit	Topic	No. of

		Lectures
1	(List of experiments given are suggestive. One experiment from each group to be demonstrated) 1.Identification of elements (N, S, and halogen) and Functional group tests for alcohols, phenols, carbonyl, carboxylic acid and amine group of compounds. 2. **Organic preparations:** i. Acetylation of one of the following compounds: amines (aniline, *o*-, *m*-, *p*-toluidines and *o*-, *m*-, *p*-anisidine) and phenols (β-naphthol, vanillin, salicylic acid) by any one method: (Using conventional method.and Using green chemistry approach) ii. Benzolyation of one of the amines (aniline, *o*-, *m*-, *p*- toluidines and *o*-, *m*-, *p*-anisidine) and one of the phenols (*β*-naphthol, resorcinol, *p*-cresol) by Schotten-Baumann reaction. iii. Oxidation of ethanol/ isopropanol (Iodoform reaction). iv. Bromination (any one) a. Acetanilide by conventional methods b. Acetanilide using green approach (Bromate-bromide method) v. Nitration: (any one) a. Acetanilide/nitrobenzene by conventional method b. Salicylic acid by green approach (using ceric ammonium nitrate). vi. Selective reduction of *meta* dinitrobenzene to *m*-nitroaniline. vii. Reduction of *p*-nitrobenzaldehyde by sodium borohydride. viii. Hydrolysis of amides and esters. ix. Semicarbazone of any one of the following compounds: acetone, ethyl methyl ketone, cyclohexanone, benzaldehyde. x. *S*-Benzylisothiouronium salt of one each of water soluble/ insoluble acids (benzoic acid, oxalic acid, phenyl acetic acid and phthalic acid). xi. Aldol condensation with either conventional or green method. xii. Benzil-Benzilic acid rearrangement. Collected solid samples may be used for recrystallization, melting point and TLC.	**60**

Part C – Learning Resources

Text Books, Reference Books, Other resources

Suggested Reading:

1 Mann, F.G. & Saunders, B.C. *Practical Organic Chemistry*, Pearson Education (2009)
2 Furniss, B.S., Hannaford, A.J., Smith, P.W.G. & Tatchell, A.R. *Practical Organic Chemistry, 5th Ed.* Pearson (2012)
3 Ahluwalia, V.K. & Aggarwal, R. *Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis,* University Press (2000)
4 Ahluwalia, V.K. & Dhingra, S. *Comprehensive Practical Organic Chemistry: Qualitative Analysis,* University Press (2000).

Suggested equivalent online:

Keywords:

Recrystallization, Aldolcondensation, Semicarbazone, dinitrobenzene, Iodoform, aniline, *o*-, *m*-, *p*-toluidines.