

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 | | | |
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| Program: UG (Certificate) | Class: B.Sc. Chemistry | Semester: II | Session: 2022-23 |
| Subject: Chemistry (Honours) | | | |
| 1 | Course code | CHCT-02 | |
| 2 | Course title | Organic Chemistry-I | |
| 3 | Course type | Major/Minor | |
| 4 | Pre-requisite (if any) | To study this course, a student must have had the subject Chemistry in Class 12th. | |
| 5 | Course Objective | The core course Organic Chemistry I is designed in a manner that it forms a cardinal part of the learning of organic chemistry for the subsequent semesters. The course is infused with the recapitulation of fundamentals of organic chemistry and the introduction of a new concept of visualizing the organic molecules in a three-dimensional space. To establish the applications of these concepts, the functional groups- alkanes, alkenes, alkynes and aromatic hydrocarbons are introduced. The constitution of the course strongly aids in the paramount learning of the concepts and their applications. | |
| 6 | Course Learning Outcomes (CLO) | On completion of the course, the student will be able to: <ul style="list-style-type: none">• Understand and explain the different nature and behavior of organic compounds based on fundamental concepts learnt.• Formulate the mechanism of organic reactions by recalling and correlating the fundamental properties of the reactants involved.• Learn and identify many organic reaction mechanisms including Free Radical Substitution, Electrophilic Addition and Electrophilic Aromatic Substitution.• Understand the fundamental concepts of stereochemistry. | |
| 7 | Credit Value | 4 | |
| 8 | Total Marks | Max. Marks (40+60): CCE+ESE | Min. Passing Marks: |
| Part B – Content of the course | | | |
| Total No. of Lectures-Tutorials-Practical (4 hours per week): L-T-P: 45-0-00 | | | |
| Unit | Topic | | No. of Lectures |
| 1 | Basics of Organic Chemistry: Organic Compounds: Classification, and Nomenclature, Hybridization, Shapes of molecules, Influence of hybridization on bond properties. Electronic Displacements: Inductive, | | 10 |

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| | <p>electromeric, resonance and mesomeric effects, hyperconjugation and their applications; Dipole moment; Organic acids and bases; their relative strength. Homolytic and Heterolytic fission with suitable examples. Curly arrow rules, formal charges; Electrophiles and Nucleophiles; Nucleophilicity and basicity; Types, shape and relative stabilities of reaction intermediates (Carbocations, Carbanions, Free radicals and Carbenes).</p> <p>Organic reactions and their mechanism: Addition, Elimination and Substitution reactions.</p> | |
| 2 | <p>Stereochemistry:</p> <p>Concept of asymmetry, Fischer Projection, Newmann and Sawhorse projection formulae and their interconversions; Geometrical isomerism: cis-trans and, syn-anti isomerism E/Z notations with C.I.P rules. Optical Isomerism: Optical Activity, Specific Rotation, Chirality/Asymmetry, Enantiomers, Molecules with two or more chiral-centres, Distereoisomers, meso structures, Racemic mixtures, Relative and absolute configuration: D/L and R/S designations.</p> | 06 |
| 3 | <p>Chemistry of Aliphatic Hydrocarbons:</p> <p>A. Carbon-Carbon sigma bonds</p> <p>Chemistry of alkanes: Formation of alkanes, Wurtz Reaction, Wurtz- Fittig Reactions, Free radical substitutions: Halogenation - relative reactivity and selectivity.</p> <p>B. Carbon-Carbon pi-bonds</p> <p>Formation of alkenes and alkynes by elimination reactions, Mechanism of E1, E2, E1cb reactions. Saytzeff and Hofmann eliminations. Reactions of alkenes: Electrophilic additions their mechanisms (Markownikoff/ Anti Markownikoff addition), mechanism of oxymercuration-demercuration, hydroboration- oxidation, ozonolysis, reduction (catalytic and chemical), syn and anti-hydroxylation (oxidation). 1, 2- and 1, 4- addition reactions in conjugated dienes and, Diels-Alder reaction; Allylic and benzylic bromination and mechanism, e.g. propene, 1-butene, toluene, ethyl benzene. Reactions of alkynes: Acidity, Electrophilic and Nucleophilic additions.</p> <p>C. Cycloalkanes and Conformational Analysis</p> <p>Cycloalkanes and stability, Baeyer strain theory, Conformation analysis, Energy diagrams of cyclohexane: Chair, Boat and Twist boat forms.</p> | 16 |
| 4 | <p>Carbon-Carbon pi Bonds (Alkenes and Alkynes)</p> <p>Structure and isomerism. General methods of preparation, physical and chemical properties. Mechanism, of E1, E2, E1cb reactions, Saytzeff and Hoffmann eliminations, Electrophilic Additions, mechanism with suitable examples, (Markownikoff/Antimarkownikoff addition), <i>syn</i> and <i>anti</i>-addition; addition of H₂, X₂, oxymercuration-demercuration, hydroboration-oxidation, ozonolysis, hydroxylation, Diels Alder reaction, 1,2-and 1,4-addition reactions in conjugated dienes.</p> <p>Mechanism of allylic and benzylic bromination in propene, 1-butene, toluene, ethyl benzene.</p> <p>Reactions of alkynes; acidity, electrophilic and nucleophilic additions, hydration to form carbonyl compounds, Alkylation of terminal alkynes.</p> | 18 |
| 5 | <p>Aromatic Hydrocarbons</p> | 06 |

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| | Aromaticity: Huckel's rule, aromatic character of arenes, cyclic carbocations/carbanions and heterocyclic compounds with suitable examples. Electrophilic aromatic substitution: halogenation, nitration, sulphonation and Friedel-Craft's alkylation/acylation with their mechanism. Directing effects of substituent groups. | |
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Part C – Learning Resources

Text Books, Reference Books, Other resources

Suggested Reading:

1. Morrison, R. N. & Boyd, R. N. *Organic Chemistry*, 6th Edn., Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. Pine S. H. *Organic Chemistry*, Fifth Edition, McGraw Hill, (2007)
3. F. A. Carey, *Organic Chemistry*, Seventh Edition, Tata McGraw Hill (2008).
4. J. Clayden, N. Greeves, S. Warren, *Organic Chemistry*, 2nd Ed., (2012), Oxford University Press.
5. F. A. Carey, R. J. Sundberg, *Advanced Organic Chemistry, Part A: Structure and mechanism*, Kluwer Academic Publisher, (2000).

Suggested equivalent online:

Part D – Assessment & Evaluation

Suggested Continuous Evaluation Method

Any remark / suggestion:

This course can be opted as an elective by the students of the following subjects:

Open for All

Continuous & Comprehensive Evaluation shall be based on allotted Assignment and Class Test

Keywords:

Alkanes, Alkenes, Alkynes, Aromatic Hydrocarbons, Cycloalkanes, Hybridisation, Stereochemistry.

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Department of Chemistry

Syllabus for B.Sc. Chemistry

(CBCS & NEP 2020)

Session 2022-23

Part A - Introduction

| | | | |
|--------------------------------------|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| Program: UG (Certificate) | Class: B.Sc. Chemistry | Semester: II | Session: 2022-23 |
| Subject: Chemistry | | | |
| 1 | Course code | CHCP-02 | |
| 2 | Course title | Organic Chemistry-I (Practical) | |
| 3 | Course type | Major/Minor | |
| 4 | Pre-requisite (if any) | To study this course, a student must have had the subject Chemistry in class 12th. | |
| 5 | Course Objective | <ul style="list-style-type: none">• To enhance the knowledge and make more productive about outcome.• To develop the connectivity with reaction mechanism.• To develop the capability of learning. | |
| 6 | Course Learning Outcomes (CLO) | By the end of the course, students will be able to: <ul style="list-style-type: none">• Calibrate the thermometer• Purification and analysis of liquids.• Identify organic compounds using melting point and boiling point method as well as by using chromatography separation technique. | |
| 7 | Credit Value | 2 | |
| 8 | Total Marks | Max. Marks (40+60): | Min. Passing Marks: |

Part B – Content of the course

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

L-T-P: 00-0-15

| Unit | Topic | No. of Lectures |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| 1 | <ol style="list-style-type: none">1. Checking the calibration of the thermometer.2. Purification of organic compounds by crystallization using the following solvents:<ol style="list-style-type: none">a. Waterb. Alcoholc. Alcohol-Water3. Determination of the melting points of given organic compounds and unknown organic compounds (using Kjeldahl method and electrically heated melting point | 15 |

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| | apparatus). 4. Effect of impurities on the melting point – mixed melting point of two unknown organic compounds. 5. Determination of boiling point of liquid compounds. (boiling point lower than and more than 100 °C by distillation and capillary method) c. Separation of a mixture of <i>o</i> -and <i>p</i> -nitrophenol or <i>o</i> -and <i>p</i> -aminophenol by thin layer chromatography (TLC). 6. Determination of boiling point of liquid compounds. (boiling point lower than and more than 100 °C by distillation and capillary method) c. Separation of a mixture of <i>o</i> -and <i>p</i> -nitrophenol or <i>o</i> -and <i>p</i> -aminophenol by thin layer chromatography (TLC). 7. Chromatography <ol style="list-style-type: none"> a. Separation of a mixture of two amino acids by ascending and horizontal paper chromatography b. Separation of a mixture of two sugars by ascending paper chromatography | |
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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)

Suggested equivalent online:

Part D – Assessment & Evaluation

Suggested Continuous Evaluation Method

Any remark / suggestion:

This course can be opted as an elective by the students of the following subjects:

Open for All

Continuous & Comprehensive Evaluation shall be based on allotted Assignment and Class Test

Keywords:

1. Separation, Detection, Chromatography, Kjeldahl, distillation, melting point,