



University of Kerala

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| Discipline | CHEMISTRY | | | | |
| Course Code | UK2DSCCHE103 | | | | |
| Course Title | ESSENTIALS OF ORGANIC CHEMISTRY | | | | |
| Type of Course | DSC | | | | |
| Semester | 2 | | | | |
| Academic Level | 100 - 199 | | | | |
| Course Details | Credit | Lecture per week | Tutorial per week | Practical per week | Total Hours/Week |
| | 4 | 3 hours | - | 2 hours | 5 |
| Pre-requisites | 1. Higher secondary level science knowledge 2. First semester DSC (Chemistry) offered by UoK (preferable) | | | | |
| Course Summary | The course covers the fundamentals of organic chemistry, stereochemistry, bioinorganic chemistry, medicinal chemistry, and practical organic qualitative analysis techniques. Students learn about the reactivity of organic compounds, stereochemical principles, biological roles of metals, pharmacognosy, and analytical methods for organic compound identification and purification. | | | | |

Detailed Syllabus:

| Module | Unit | Content | Hrs |
|-----------|------|---|-----------|
| | | ESSENTIALS OF ORGANIC CHEMISTRY | 75 |
| I | | BASICS OF ORGANIC REACTION MECHANISM | 9 |
| | 1 | Electronic Displacements: Inductive, electromeric, resonance and mesomeric effects, hyperconjugation and their applications | 3 |
| | 2 | Dipole moment; Organic acids and bases; their relative strength. | 2 |
| | 3 | Homolytic and heterolytic fission with suitable examples. Curly arrow rules; Electrophiles and Nucleophiles; Nucleophilicity and basicity | 2 |
| | 4 | Types, shape and relative stability of carbocations, carbanions, free radicals and carbenes. Introduction to types of organic reactions - Addition, Elimination and Substitution reactions. | 2 |
| II | | INTRODUCTION TO STEREOCHEMISTRY | 9 |
| | 5 | Optical Isomerism: Chirality and elements of symmetry; DL notation and Enantiomers | 2 |
| | 6 | Optical isomerism in glyceraldehydes, lactic acid and tartaric acid | 2 |
| | 7 | Diastereoisomers and mesocompounds | 1 |
| | 8 | Cahn-Ingold-Prelog rules – R-S notations for optical isomers with one and two asymmetric carbon atoms | 2 |

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| | 9 | Racemic mixture, resolution and methods of resolution | 2 |
| III | CHROMATOGRAPHY | | 9 |
| | 10 | Outline study of Adsorption and partition chromatography | 2 |
| | 11 | Principle and applications of column, paper, thin layer, ion- exchange and gas chromatography | 3 |
| | 12 | Principle and applications of HPLC, R_f and R_t value of various chromatographic techniques | 2 |
| | 13 | Paper chromatographic separation of amino acids and sugars Separation of a mixture of dyes by column chromatography. Principle and applications of TLC | 2 |
| IV | INTRODUCTION TO MEDICINAL CHEMISTRY - PHYTOCHEMICALS AND DRUGS | | 18 |
| | 14 | Pharmacognacy – Scope and importance, scheme for pharmacognotic studies of crude drugs | 2 |
| | 15 | Phytochemicals. Crude drugs: Morphological, pharmacological and chemical classification | 2 |
| | 16 | Collection and processing of crude drugs – collection and harvesting, drying, garbling, packing | 2 |
| | 17 | Processing of drugs: Method of preparation – decoction, maceration and infusion | 2 |
| | 18 | Methods of drug evaluation: Moisture content, volatile content, solubility, optical rotation, ash values and extracting, spectroscopic analysis, chromatographic method and foreign organic matter (Mention only) Phytoconstituents of therapeutic values | 3 |
| | 19 | Phytoconstituents of therapeutic values: Carbohydrates, glycosides (saponin glycosides and cardiac glycosides), alkaloids (quinoline, isoquinoline, indole alkaloids and steroidal alkaloids), volatile oils and phenols (Mention their sources, important compounds in each class and therapeutic importance only) | 3 |
| | 20 | Drugs-Classification based on application. Elementary study of analgesics, antipyretics, antibiotics, antimalarials. sulphadruugs, mode of action of sulphadruugs. Synthesis of aspirin and paracetamol | 4 |
| V | PRACTICALS: ORGANIC QUALITATIVE ANALYSIS | | 30 |
| | 22 | Section A: Organic Qualitative Analysis (Any 5 compounds with different functional groups are compulsory) Systematic analysis with a view to identify the organic compound (aromatic – aliphatic, saturated – unsaturated, detection of elements and detection of functional groups) – polynuclear hydrocarbons, alcohols, phenols, halogen compounds, nitro compounds, amino compounds, aldehydes, ketones, carboxylic acids, amides, urea, thiourea and esters. Only monofunctional compounds are to be given. | 15 |
| | 23 | Section B (Open ended: Any 3 experiments are to be conducted - May be selected from the list or the teacher can add experiments) 1. Preparation of derivatives of above analysed organic compounds | 15 |

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| | | 2. Identification of Carbohydrates: Glucose, fructose, sucrose and starch. 3. TLC - Separation and identification- Determination of R _f value of o- and p-nitroanilines, o- and p-chloroanilines, p-chlorophenol and p-nitrophenol, p-chloroaniline and p-nitroaniline, benzil and o-nitroaniline or any two amino acids. 4. Preparation of Soap | |
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References

1. S. M. Khopkar, *Analytical chemistry*.
2. Gurdeep Chatwal, *Chemistry of natural products Vol. 1*.
3. P. L Soni, H. M. Chowla, *Text Book of Organic Chemistry*.
4. I.L. Finar, *Organic Chemistry Vol 1 & 2*.
5. Arun Bahl & B S Bahl, *Text Book of Organic Chemistry*.
6. *Elementary practical organic chemistry. Part 2: Qualitative Organic analysis.* von A. I. Vogel. Longmans, Green & Co. Ltd., London.

Course Outcomes

| No. | Upon completion of the course the graduate will be able to | Cognitive Level | PSO addressed |
|------|--|-----------------|---------------|
| CO-1 | Analyze the fundamental principles of organic chemistry to interpret reaction mechanisms and predict chemical behavior of organic compounds. | U, An | PSO-1 |
| CO 2 | Evaluate the stereochemical principles of organic compounds, including their spatial arrangements, isomerism, and the impact of stereochemistry on reactivity and properties. | Ap, An | PSO-2 |
| CO 3 | Analyze the principles, methodologies, and applications of various chromatographic techniques and evaluate their effectiveness in the separation of organic compounds. | An | PSO-1 |
| CO 4 | Develop a systematic approach to pharmacognostic studies of crude drugs, evaluate their phytochemical properties, processing methods, and therapeutic applications, and synthesize essential pharmaceutical compounds. | Ap, An | PSO-5 |
| CO 5 | Apply the principles in analytical chemistry to identify the organic compounds | Ap, An | PSO-2 |

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: ESSENTIALS OF ORGANIC CHEMISTRY

Credits: 3:0:1 (Lecture:Tutorial:Practical)

| CO No. | CO | PO/ PSO | Cognitive Level | Knowledge Category | Lecture (L)/ Tutorial (T) | Practical (P) |
|--------|------|---------------|-----------------|--------------------|---------------------------|---------------|
| 1 | CO-1 | PO-1 PSO-1 | U, An | C | L | |
| 2 | CO 2 | PO-3 PSO-2 | Ap, An | P | L | |
| 3 | CO 3 | PO-1 PSO-1 | An | C | L | |
| 4 | CO 4 | PO-3 PSO-5 | Ap, An | M | L | |
| 5 | CO 5 | PO-3 PSO-5 | Ap, An | P | L | |

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs:

| | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|-------------|-------|-------|-------|-------|-------|-----|-----|-----|-----|-----|-----|-----|-----|
| CO 1 | 2 | - | - | - | - | 2 | - | - | - | - | - | - | - |
| CO 2 | - | 2 | - | - | - | - | - | 2 | - | - | - | - | - |
| CO 3 | 2 | - | - | - | - | 2 | - | - | - | - | - | - | - |
| CO 4 | - | - | - | - | 2 | - | - | 2 | - | - | - | - | - |
| CO 5 | - | 3 | - | - | - | - | 3 | - | - | - | - | - | - |

Correlation Levels:

| Level | Correlation |
|-------|--------------------|
| - | Nil |
| 1 | Slightly / Low |
| 2 | Moderate / Medium |
| 3 | Substantial / High |

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

| | Internal Exam | Assignment | Project Evaluation | End Semester Examinations |
|------|---------------|------------|--------------------|---------------------------|
| CO 1 | √ | √ | | √ |
| CO 2 | √ | √ | | √ |
| CO 3 | √ | √ | | √ |
| CO 4 | √ | | | √ |
| CO 5 | √ | | | √ |