

# COURSE WISE BREAKUP

Fourth Year      Seventh Semester

SPECILIZATION

ORGANIC CHEMISTRY

## THEORY

COURSE CODE	TITLE	CREDIT HOURS	MARKS
CHEM-461	PAPER-I: ORGANIC CHEMISTRY	03	100
CHEM-462	PAPER-II: ORGANIC CHEMISTRY	03	100
CHEM-463	PAPER-III: ORGANIC CHEMISTRY	03	100

## PRACTICALS

COURSE CODE	TITLE	CREDIT HOURS	MARKS
CHEM-461	PAPER-I: ORGANIC CHEMISTRY	02	50
CHEM-462	PAPER-II: ORGANIC CHEMISTRY	02	50
CHEM-463	PAPER-III: ORGANIC CHEMISTRY	02	50

- Total Credits of the Semester = 15 (theory 09 & practicles 06 credits)
- Maximum Marks = 450 (theory 300 & practicles 150 marks)

## 4<sup>th</sup> Year; 7<sup>th</sup> Semester

### PAPER-I

Title of the Course: ORGANIC CHEMISTRY

Code: CHEM-461

Credit Hours: 03

Marks: 100

#### **Course Contents:**

##### **Oxidation and Reduction**

**Oxidation:** Introduction; reactions involving elimination of hydrogen, cleavage of C-C bond, replacement of hydrogen by oxygen and addition of oxygen to the substrate; oxidative coupling.

**Reduction:** Introduction; reactions involving replacement of oxygen by hydrogen, removal of oxygen from the substrate and reduction with cleavage; reductive coupling.

##### **Protective Groups**

Use of hydroxyl-, amino-, carboxyl- and carbonyl- protecting groups in organic synthesis.

##### **Pericyclic Reactions**

Principles; cycloadditions; electrocyclic reactions; cheletropic reactions; sigmatropic rearrangements; the ene-reaction and related reactions.

#### **RECOMMENDED BOOKS:**

1. Norman, R. O.C. and Coxon, J. M., "Principles of Organic Synthesis", Nelson Thornes, Cheltenham.
2. Rinehart Jr., K. L., "Oxidation and Reduction of Organic Compounds", Prentice-Hall, London.
3. Loudon, G. M., "Organic Chemistry", Oxford University Press, New York.
4. Smith, M. B., "Organic Synthesis", McGraw-Hill, New York.
5. March, J., "Advanced Organic Chemistry", John Wiley & Sons, New York.
6. Sykes, P., "A Guide Book to Mechanism in Organic Chemistry", Longman, London.
7. Clayden, J., Greeves, N., Warren, S. and Wothers, P., "Organic Chemistry", Oxford University Press, New York.
8. Carey, F. A. and Sundberg, R. J. "Advanced Organic Chemistry Part B: Reactions and Synthesis", Plenum Press, New York.
9. Morrison, R. T. and Boyd, R. N., "Organic Chemistry", Prentice- Hall of India, New Delhi.

10. Bruckner, R., "Advanced Organic Chemistry-Reaction Mechanisms", Harcourt Science & Technology Company, New York.
11. March, J., "Advanced Organic Chemistry", John Wiley & Sons, New York.
12. House, H. O., "Modern Synthetic Reactions", The Benjamin/Cummings Publishing Company, California.
13. Finar, I. L., "Organic Chemistry", Vol. 1, Pearson Education, Delhi.
14. Greene, T. W., "Protective Groups in Organic Synthesis", John Wiley & Sons, New York.

#### **4<sup>th</sup> Year; 7<sup>th</sup> Semester**

#### **PAPER-II**

Title of the Course: **ORGANIC CHEMISTRY**

Code: **CHEM-462**

Credit Hours: **03**

Marks: **100**

#### **Course Contents:**

##### **Molecular Rearrangements**

Types of rearrangements; general mechanisms of nucleophilic, free radical and electrophilic rearrangements; reactions: hydrogen and/or carbon migration to electron-deficient carbon, nitrogen and oxygen; carbon migration to electron-rich carbon; aromatic rearrangements: interand intra-molecular carbon migration from oxygen to carbon.

##### **Free Radicals**

Introduction; radical generation; radical detection; radical shape and stabilization; radical reactions: addition reactions - addition of halogens, hydrogen halides, halomethanes, other carbon radicals and S-H compounds; substitution reactions-halogenation, oxidation and substitution involving aryl radicals.

##### **Reactive Intermediates**

Carbenes, nitrenes, and arynes: Their generation, stability, reactions and synthetic applications.

#### **RECOMMENDED BOOKS:**

1. March, J., "Advanced Organic Chemistry", John Wiley & Sons, New York

2. Norman, R. O.C. and Coxon, J. M., "Principles of Organic Synthesis", Nelson Thornes, Cheltenham.
3. Bruckner, R., "Advanced Organic Chemistry-Reaction Mechanisms", Harcourt Science & Technology Company, New York.
4. Morrison, R. T. and Boyd, R. N., "Organic Chemistry", Prentice- Hall of India, New Delhi.
5. Carey, F. A. and Sundberg, R. J., "Advanced Organic Chemistry Part A: Structure and Mechanisms", Kluwer Academic /Plenum Publishers, New York.
6. Sykes, P., "A Guide Book to Mechanism in Organic Chemistry", Longman, London.
7. Clayden, J., Greeves, N., Warren, S. and Wothers, P., "Organic Chemistry", Oxford University Press, New York.
8. Gilchrist, T. L. and Rees, C. W., "Carbenes, Nitrenes and Arynes", Nelson, London.
9. Pine, S. H., "Organic Chemistry", National Book Foundation, Islamabad.
10. Loudon, G. M., "Organic Chemistry", Oxford University Press, New York.
11. McMurry, J., "Organic Chemistry", Brooks/Cole Publishing Company, California.
12. Finar, I. L., "Organic Chemistry", Vol. 1, Pearson Education, Delhi.
13. Smith, M. B., "Organic Synthesis", McGraw-Hill, New York.
14. Lwowski, W., "Nitrenes", Interscience Publishers, New York.

#### **4<sup>th</sup> Year; 7<sup>th</sup> Semester**

#### **PAPER-III**

Title of the Course: **ORGANIC CHEMISTRY**

Code: **CHEM-463**

Credit Hours: **03**

Marks: **100**

#### **Course Contents:**

#### **Organic Spectroscopy**

A brief review of introductory organic spectroscopy. <sup>1</sup>H-NMR and <sup>13</sup>C-NMR

Chemical shift; factors affecting chemical shift; spin relaxation; spin-spin coupling; coupling constants; factors affecting coupling constants; 2-D NMR.

## **Mass Spectrometry**

Introduction; mass spectrometers; ionization and ion sources: electron impact and chemical ionization; field ionization; field desorption; fast atom bombardment; plasma desorption, thermospray and electrospray mass spectra; fragmentation pattern of common functional groups. Combined usage of IR, UV, NMR and Mass spectrometric methods for structure elucidation of organic compounds having medium complexity.

## **Aromatic Heterocycles**

Introduction; nomenclature; structure and aromaticity; basicity and acidity of the nitrogen heterocycles; chemistry of furan, pyrrole and thiophene; synthesis of indoles and isoindoles; chemistry of pyridine, quinoline and isoquinoline; occurrence of heterocyclic compounds.

### **4<sup>th</sup> Year; 7<sup>th</sup> Semester**

#### **PAPER-I**

Title of the Practical: **ORGANIC CHEMISTRY** Code: **CHEM-461**

Credit Hours: **02** Marks: **50**

*Laboratory work illustrating topics covered in the lecture of papers I.*

### **4<sup>th</sup> Year; 7<sup>th</sup> Semester**

#### **PAPER-II**

Title of the Practical: **ORGANIC CHEMISTRY** Code: **CHEM-462**

Credit Hours: **02** Marks: **50**

*Laboratory work illustrating topics covered in the lecture of papers II.*

### **4<sup>th</sup> Year; 7<sup>th</sup> Semester**

#### **PAPER-III**

Title of the Practical: **ORGANIC CHEMISTRY** Code: **CHEM-462**

Credit Hours: **02** Marks: **50**

*Laboratory work illustrating topics covered in the lecture of papers III.*

### **RECOMMENDED BOOKS:**

1. Kemp, W., "Organic Spectroscopy", Palgrave, New York.
2. Silverstein, R. N., Barrler, G. C. and Morrill, T. C., "Spectrometric Identification of Organic Compounds", John Wiley & Sons, New York.
1. Williams D. H. and Fleming, I., "Spectroscopic Methods in Organic Chemistry", Athlone Press, London.
2. Atta-ur-Rehman, "Nuclear Magnetic Resonance Spectroscopy", UGC, Islamabad.
3. Davis, R. and Freason, M., "Mass Spectrometry", John Wiley & Sons, New York.
4. Bansal, R. K., "Heterocyclic Chemistry", Wiley Eastern Ltd., New Delhi.
5. Loudon, G. M., "Organic Chemistry", Oxford University Press, New York.
6. Lambert, J. B, Shurvell, H. F., Lightner, D. A. and Cooks, R. G., "Introduction to Organic Spectroscopy", Macmillan Publishing Company, New York.
7. Anderson, R. J., Bendell, D. and Groundwater, P., "Organic Spectroscopic Analysis", The Royal Society of Chemistry, Cambridge.
8. Gilchrist, T. L., "Heterocyclic Chemistry", Longman, Singapore.
9. Joule, J. A. and Mills, K., "Heterocyclic Chemistry", Blackwell Science, Tokyo.
- 10.