Birla Institute of Technology & Science, Pilani
Hyderabad Campus

FIRST SEMESTER 2020-2021

Course Handout Part II

Date: 17.08.2020

Course No: CHEM F212
Course Title: **ORGANIC CHEMISTRY -I**
Instructor-in-charge: Manab Chakravarty

1. Scope and objective of the course: To familiarize the students with basic mechanistic aspects of organic reactions including mechanistic types, thermodynamics and kinetics, the important intermediates involved in organic reactions, functional group chemistry.

2. Text Book: R. T. Morrison, R. Boyd and S. K. Bhattacharjee, Organic Chemistry, 7th edition. **(T1)**

Reference Books: J. Clayden, N. Greeves, S. Warren, P. Wothers, Organic Chemistry, OUP, 1st ed., 2000. **(R1)**

Jerry March, Advanced Organic Chemistry, John Wiley & Sons, 4th ed., 1992. **(R2)**

G Marc Loudon, Organic Chemistry, Oxford, 4th Edition, 2002.
Francis A Carey, Organic Chemistry, Tata McGrawHill, 7th edition, 2008.

3. Course Plan:

Lec. No.	Learning objectives	Topics to be Covered	Learning Outcomes	Text book, Chapter, Page No.
1-2	Basic terminology and representation of organic reactions	Homolytic, heterolytic fission of bonds, concept of electrophiles and nucleophiles; how to write organic reaction mechanisms; movement of arrows; curved and fish-hook arrows; examples	Understanding of basic organic reactions and drawing reactions realistically towards creative organic chemistry; Representing the movement of electrons in reactions by curly arrows	**T1:** Ch. 4, pg. 55-59 **R1:** Ch. 5, pg. 116-131.
3-4	Reactive	Carbocations: Structure &	Detailed analysis on	**T1:** Ch. 4, pg. 64-69.

	intermediates: carbocations	stability, generation and reactions	the generation, character, type and role of the useful intermediate carbocation in organic reactions, application in organic synthesis with stereochemical outcome	
5	Reactive intermediates: carbanions	Carbanions: Structure & stability, generation and reactions	Idea about another intermediate and difference between cation and anion intermediates in terms of the synthesis, behavior etc. Use of such intermediate in organic reactions	**T1:** Ch. 4, pg. 69-72.
6-7	Reactive intermediates: free radicals	Free radicals: Structure & stability, generation and reactions	Intermediate with a free electron and their reactions follow different rules than ionic intermediates, Idea of polymerization.	**T1:** Ch. 4, pg. 81-86.
8-10	Reactive intermediates: others	Carbenes; nitrenes: generation, stability, and fate	Substrate Conditions to generate carbenes, Carbenes are neutral species with only six electrons, electrophilic nature, insertion reaction and application in organic synthesis and modern development; How different these are with the ionic intermediates. Same information related to nitrene is expected to be gained as nitrenes are the nitrogen analogue of carbenes.	**T1:** Ch. 4, pg. 72-78.
11-13	Aromatic chemistry	Aromatic nucleophilic substitutions; Aromatic electrophilic substitutions;	Concept of aromaticity, Understanding the	**T1:** Ch. 5C, pg. 262-283; Ch. 9, pg. 488-502. **R1:** Ch. 23 , pg. 589-604.

		S_NAr mechanism; benzyne mechanism;	ways to functionalize the aromatic ring and its usefulness to generate medicines and functional materials	
14-17	Thermodynamics and kinetics of reactions	Thermodynamic and kinetic control; Hammond postulate; methods to determine mechanisms (Hammett equation, kinetic isotopic effect); examples	Importance in proposing mechanism, how the thermodynamic and kinetic parameters help to determine the feasibility of reactions (the speed and energy), how a reaction rate can vary with different substitution.	**T1:** Ch. 4, pg. 97-102. **R1**: Ch. 13, pg.319-330. Ch. 22, pg. 554-556. Ch. 41, pg.1090-1101. **R2:** Ch. 6, pg. 208-215, 217-219, 226.
18-21	Alkyl and aryl halides	Synthesis and reactions of alkyl and aryl halides	How this halides are related to our daily needs and the chemistry behind the fact	**T1:** Ch. 8, pg. 426-462. Ch. 9, pg. 482-485.
22-25	Alcohols, phenol and ethers	Synthesis, reactivity; applications of Grignard reagents for synthesis; diols, acid/base catalysed ring opening	The chemistry involved in the naturally occurring functional groups that contain polar C-O bond, the distinct reactivity of these functional groups will be understood.	**T1:** Ch. 10, pg. 507-537. Ch. 11, pg. 545-562. Lecture notes (epoxides)
26-28	Amines and nitro compounds	Synthesis, basicity and reactions	Many interesting natural products and widely used drugs are amines; hence such functional group chemistry will be learnt.	**T1:** Ch. 15, pg. 696-736. and Lecture Notes (Nitro compounds)
29-37	Carbonyl compounds	Synthesis, reactivity, enolates, malonate and ethyl acetoacetate synthesis Aldol, Crossed Aldol and Claisen condensation; Conjugate addition reactions of α, β-unsaturated carbonyl	Concept about the most important functional group because its electon-deficient carbons and easily broken π-bond. The important name reactions and their	**T1:** Ch. 12, pg. 571-611. **R1:** Ch. 21, pg. 524-541. Lecture notes (malonate & ethyl acetoacetate)

		compounds with special reference to Michael addition, Mannich reaction, Wittig reaction	applications in organic synthesis to synthesize medicinally useful molecules.	
38-40	Carboxylic acid & derivatives	Synthesis, reactions, conversion for acid to other derivatives	Enrich with this interesting functional groups in terms of preparation, features important products such as aspirin	**T1:** Ch. 13, pg. 624-648; Ch. 14, Pg. 657-685.
41-42	Carbohydrates	Introduction and their reactions	Concept on the largest group of organic molecules in nature, the basic structures and reactions of carbohydrates	T1: Ch. 26, pg. 1228-1236, 1244-1253.

4. Evaluation:

Component	Duration	Weightage (%)	Date and Time	Remarks
Test 1	30 min.	10	September 10 – September 20 (During scheduled class hour)	**Open Book**
Test 2	30 min.	15	October 09 –October 20 (During scheduled class hour)	**Open Book**
Test 3	30 min	15	November 10 – November 20 (During scheduled class hour)	**Open book**
Viva/interaction/assignment	continuous	30	continuous	**Open book**
Comprehensive Examination	120 min	30	TBA	**Open book**

5. Make-up(s) will be granted only for genuine reasons.
6. Chamber consultation hours: : To be announced
7. Notices: All the notices pertaining to this course will be displayed on **CMS.**
8. **Academic Honesty and Integrity Policy**: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Instructor-in-Charge

Organic Chemistry - I


innovate
achieve
lead