



SUMMER TERM -2022
Course Handout Part - II

Date:

28.05.2022

In addition to part I (general handout for all courses appended to the timetable) this portion gives specific details regarding the course.

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

1.Course Description: This course is a basic introductory course to organic chemistry.

2.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.

3. 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 edition 1992.

(R2)

G Marc Loudon, Organic Chemistry, Oxford, 4th Edition, 2002. **(R3)**

Francis A Carey, Organic Chemistry, Tata McGrawHill, 7th edition, 2008. **(R4)**

4. Course Plan:

Lec. No.	Learning objectives	Topics to be Covered	Learning Outcomes	Chapter in the Text Book
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. Lecture notes
3-4	Reactive intermediates: carbocations	Carbocations: Structure & stability, generation and reactions	Detailed analysis on the generation, character, type and role of the useful	T1: Ch. 4, pg. 64-69. Lecture notes

			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. Lecture notes
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. Lecture notes
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. Lecture notes
11-13	Aromatic chemistry	Aromatic nucleophilic substitutions; Aromatic electrophilic substitutions; S _N Ar mechanism; benzyne mechanism;	Concept of aromaticity, Understanding the ways to functionalize the aromatic ring and its usefulness to	T1: Ch. 5C, pg. 262-283; Ch. 9, pg. 488-502. R1: Ch. 23, pg. 589-604. Lecture notes

			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. Lecture notes
18-21	Alkyl and aryl halides	Synthesis and reactions of alkyl and aryl halides	How these halides are related to our daily needs and the chemistry behind the fact	T1: Ch. 8, pg. 426-462. Ch. 9, pg. 482-485. Lecture notes
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 compounds with special reference to Michael addition, Mannich reaction,	Concept about the most important functional group because its electron-deficient carbons and easily broken π -bond. The important name reactions and their applications in organic synthesis to synthesize medicinally	T1: Ch. 12, pg. 571-611. R1: Ch. 21, pg. 524-541. Lecture notes (malonate & ethyl acetoacetate)

		Wittig reaction	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. Lecture notes
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. Lecture notes

5. Evaluation:

Component	Duration	Weightage (%)	Date and Time	Remarks
Mid-semester test	90 min.	30	25/06 (Saturday) 9:30-11 AM	Closed Book
Assignment	-	15	Continuous	Open Book
Seminar / Presentation	15 min.	10	After midsem	Open Book
Comprehensive Examination	180 min.	45	22/07 (Friday) 9:00 – 12 Noon	Closed Book

6. Make-up(s) will be granted only for genuine reasons.

7. Chamber consultation hours: To be announced

8. Notices: All the notices pertaining to this course will be displayed on **Department of Chemistry Notice Board only.**

9. 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.

10. Final grading will be done on the basis of the overall performance of a student in each of the components as

listed in item no. 5. For **mid-semester grading**, progress made by a student up to that point of time would be evaluated.

Instructor-in-
Charge
I
Organic Chemistry -

