



1st Semester 2018-19
Course Handout (Part II)

Date: August 02, 2018

In addition to part-I (General Handout for all courses appended to the time table) this portion gives further details regarding the course.

Course No: **CHEM F212**
Course Title: **ORGANIC CHEMISTRY-I**
Instructor-in-charge: **ANIL KUMAR**

1. Course description: Basic terminology and representation of organic reactions; thermodynamics and kinetics of reactions; reactive intermediates (carbocations, carbanions, free radicals, nitrenes, carbenes); aromatic chemistry; properties, preparation and reactions of alkyl halides, alcohols, ethers, amines and nitrocompounds; carbonyl compounds; carboxylic acid and derivatives; carbohydrates.

Scope and objective

- Understand the concepts of electron pushing/pulling to the fundamental organic reaction mechanisms.
- Understand the methodologies that lead to proposing a reaction mechanism.
- Understand functional group chemistry, devise organic reactions, and determine organic products formed *via* substitution, elimination, addition and rearrangement reaction and the associated mechanisms.
- Employ critical thinking and efficient problem-solving skills in organic chemistry.

2. Text Book:

- T1. R. T. Morrison, R. Boyd and S. K. Bhattacharjee, Organic Chemistry, 7th edition.
R1. W J. Clayden, N. Greeves, S. Warren, P. Wothers, Organic Chemistry. Second Edition

3. Course Plan:

Module	Topics to be covered	Reference	Learning Outcomes
1. Basic terminology and representation of organic reactions.	L1. Homolytic, heterolytic fission of bonds, concept of electrophiles and nucleophiles, curved and fish-hook arrows, movement of arrows L2. Methods for determining mechanisms: identification of reaction intermediate, stereochemical evidence etc. L3. Isotope labeling & kinetic isotopic effect. T1. Exercise problems on determination and drawing of simple reaction mechanism.	T1: Ch. 4, Pg. 55-59. R1: Ch. 5, pg. 116-123. & Lecture notes.	Write the mechanism of simple organic reactions.
2. Reactive intermediates in	L4. Structure, generation, stability and reactions of carbocation	T1: Ch. 4, pg. 64-86.	Propose the reaction mechanism involving in





organic synthesis	L5. Structure, generation, stability and reactions of carbanions L6. Structure, generation, stability and reactions of free radicals L7. Structure, generation, stability and reactions of carbenes L8. Structure, generation, stability and reactions of nitrenes L9. Structure, generation, stability and reactions of benzyne T2 & T3. Exercise problems on different carbon intermediates	R1: Ch 37, pg. 970-999 & Ch 38, pg. 1003-1023	situ generation and further reactivity of carbon intermediates
3. Kinetics and thermodynamic aspects of organic reactions	L10-11. Importance of thermodynamic and kinetics in controlling the reaction pathway L12. Hammond postulate & its application in understanding reaction mechanism L13. Hammett equation & its implication to reaction mechanism T4. Numerical problems on Hammett equation	T1: Ch. 4, pg. 97-102. R1: Ch. 39, pg. 1029-1067 Lecture notes	Propose a rationale for the formation of different products under different reaction conditions from same starting materials.
4. Reactivity of aromatic compounds	L14. Aromatic nucleophilic substitutions: addition-elimination L15. Aromatic nucleophilic substitutions: elimination-addition (benzyne) L16. Aromatic electrophilic substitutions T5. Exercise problems on Aromatic reactions.	T1: Ch. 5C, pg. 262-284; Ch. 9, pg. 488-502. R1: Ch. 21, pg. 524-541. Ch. 22 pg. 498-528.	Identify the structure of major product(s) in different aromatic reactions and propose a reasoning for their formation of major product under different conditions.
5. Functional group chemistry: Alkyl and aryl halides	L17-18. Synthesis of alkyl and aryl halides L19-20. A comparison reactions of alkyl and aryl halides T6. Exercise problems on application of reactivity of alkyl and aryl halides.	T1: Ch. 8, pg. 426-462. Ch. 9, pg. 482-485.	Perform functional group conversion of alkyl/aryl halides to other organic molecules.
6. Functional group chemistry: Alcohols, phenol and ethers	L21-22. Synthesis of alcohols, diols, phenols L23-24. Reactions of alcohols, diols and phenols	T1: Ch. 10, pg. 507-537. Ch. 11, pg. 545-562.	Convert alcohols/phenols into other organic molecules, and design synthetic





	L25. Synthesis and Reactions of ethers, acid/base catalyzed ring opening of oxirane T7. Exercise problemson application of reactivity of alcohol, phenol & ether.		schemes for preparing selected commercialized molecules such as aspirin, picric acid etc.
7. Functional group chemistry: Carbonyl compounds	L26-27. General methods for the synthesis of aldehydes and ketones L28-29. Reactivity of carbonyl compounds, aldol, crossed aldol and Claisen condensation, L30-31. Synthesis and reactivity of enolates: Malonate and ethyl acetoacetate L32. Conjugate addition reactions of , -unsaturated carbonyl compounds with special reference to Michael addition, Mannich reaction and Wittig reaction. T8-9. Tutorial problems on carbonyl chemistry	T1: Ch. 12, pg. 571-611. R1: Ch 6, pg. 125-140, Ch: 20, pg. 449-468. Ch, 26: pg. 614-652. Lecture notes	Carry out the conversion of carbonyl compounds to different and apply their application towards the constructing of C-C, C-N bonds in different molecular environments.
8. Functional group chemistry: Carboxylic acid & derivatives	L33-34. Synthesis & reactions of carboxylic acid L35. A comparative study on reactivity of different acid derivatives T 10. Tutorial Problems on carboxylic acid & derivatives.	T1: Ch. 13, pg. 624-648, Ch. 14, pg. 657-685.	Understand the reactivity of acid and their derivatives, and easily inter-convert them.
9. Functional group chemistry: Amines and nitro compounds	L36. Synthesis of amines and nitro compounds L37-38. Basicity and reactions of amines and nitro compounds T 11. Tutorial Problems on amines, & nitro compounds.	T1: Ch. 15,pg. 696-736	Convert amines and nitro compounds into various other organic molecules.
10. Introduction to Carbohydrates	L39. Introduction, classification and mutarotation L40. Reactions of monosaccharaides T12. Tutorial problems on carbohydrates.	T1: Ch. 26, pg. 1228-1236, 1244-1253.	Understand a basic knowledge of carbohydrate, and explain the existence of open and closed form in a monosaccharide

4. Evaluation

Component(s)	Duration	Weightage (%)	Remarks	Date and Time
Mid-Sem. Examination	90 min.	30	Close Book*	14/10 2:00 - 3:30 PM





BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, Pilani
Pilani Campus
Instruction Division

Continuous evaluation (Quiz/Assignment)	-	30	Close Book*	Continuous (Tutorial/Lecture)
Comprehensive Examination	3 hrs	40	Close Book* + Open Book ^s	14/12 FN

***Close Book Exam:** No reference material of any kind will be permitted inside the exam hall. Use of calculators will be allowed

^sOpen Book Exam: Use of any printed/written reference material (books and notebooks) will be permitted inside the exam hall. Loose sheets of paper will not be permitted. Computers/laptops of any kind will not be allowed inside the exam hall. Use of calculators will be allowed. No exchange of any material will be allowed.

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

6. Chamber consultation hours: To be announced in the class.

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

8. Policy on NC grade: Following two category of the students will be awarded NC grade

- Students missing any one of the evaluation component.
- Student securing less than 20% marks or less than 35% of the lower cut-off marks for A grade (whichever is lower).

Instructor-in-Charge
CHEM F212



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