



Forman Christian College Lahore Department of Chemistry

CHEM-160 Introduction to Organic and Biochemistry

Instructor:

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Course credits: 3+1

Course contents:

Bonding and structure of organic compounds, study of hydrocarbons including addition reactions of alkenes and substitution reactions of benzene with emphasis on mechanism; Petroleum products; Chemistry of food and its components including carbohydrates, proteins, lipids, nutrition and caloric intake.

Course objectives:

The main objectives of the course are as follows:

1. To lay a strong foundation of organic chemistry for students by equipping them with the knowledge of the basic concepts of organic chemistry, types of organic compounds, bonding in organic molecules, their structures and shapes, types of reactions, and reaction mechanism.
2. To empower students with the understanding of common reactions of alkanes, alkenes, alkynes, and benzene, with the emphasis on free radical reactions of alkanes, electrophilic addition reactions of alkenes and alkynes and electrophilic substitution reactions of benzene.
3. To familiarize students with the concept of balance diet, chemistry of food components including carbohydrates, proteins, and lipids.
4. To equip students with fundamental organic chemistry practical skills and hands-on lab experience.

Learning outcomes:

At the end of this course, students are expected to:

1. have acquired understanding of the basic concepts and principles of organic chemistry, such as nature and types of organic compounds, classification, nomenclature, structure, bonding, properties, reactions, and applications, etc.
2. understand characteristic reactions of alkanes, alkenes, alkynes, and benzene.
3. understand how molecules behave when they come across other molecules and how this behavior is affected by different conditions.
4. have developed ability to apply the concepts they have studied.
5. have good understanding of the chemistry of food and its components.
6. have the foundational knowledge of the structure and function of carbohydrates, proteins, and lipids.

Assessment scheme:**(A) Theory part: weightage 75%**

Assignments	10
Quizzes	10
Presentation	10
Attendance (physical/ online)	05
Midterm	20
Final Examination	20

(B) Practical part: weightage 25%

Lab performance; written work; viva.

Attendance and Class participation:

Students are expected to be punctual and regular in their classes as per the university policy. They must abide by the SOPs of the University. When on campus, they are expected to display their Identity Cards. As per the University rules, non-registered students are not allowed to attend the course.

Week-wise breakup of the course:

Week	Topics and learning/ teaching activities
1/2	Organic compounds, Nomenclature and Bonding i. Introduction to Chemistry to organic chemistry. ii. Chemical Bonding and Writing Lewis formulas/ structures. iii. Formal Charge of molecule. iv. Hybridization (sp^3 , sp^2 , and sp) with examples; bond angles and shape of molecules. Quiz
3	Introduction to Hydrocarbons i. Organic Chemistry, hydrocarbons. ii. Functional Group, classification, and nomenclature of various classes of hydrocarbons. and compounds having O-, N- and S- atom containing functional groups. iii. Structure and nomenclature of Alkanes, cycloalkanes, Alkenes, alkynes. Assignment
4	Chemistry of alkanes i. Constitutional Isomerism in Alkanes. ii. Petroleum as fuel, combustion reaction and pollution (greenhouse effect). iii. Chlorination of Alkanes (free radical mechanism). Quiz
5/6	Chemistry of alkenes i. Structure of Alkenes. ii. Reactions of Alkenes: reactivity of double bond. iii. Electrophilic Additions in detail with step-by-step mechanism: Addition of halogens, hydrohalogens, HOCl, HOBr, water, hydrogenation, (Oxymercuration-Reduction, Hydroboration-Oxidation). iv. Markovnikov and anti-Markovnikov products. Assignment
7	Chemistry of alkynes i. Structure and reactivity of alkynes. ii. Electrophilic Addition ($H-Br$, Br_2) to Alkynes. iii. Hydration of Alkynes to Aldehydes and Ketones.
	Midterm
8	Presentations by students
9/10	Chemistry of benzene (aromatic compounds) i. Benzene and the Concept of Aromaticity. ii. Electrophilic Aromatic Substitutions with mechanisms: Nitration, Halogenation, Friedel-Crafts Alkylation, Friedel-Crafts acylation, Diazonium Compounds.

	iii. Orientation; activating and deactivating groups; ortho/para/meta directors. Quiz and assignment
11/12	Biochemistry: Components of food; carbohydrates i. Food components; nutrients, caloric intake. ii. Monosaccharides: structures of trioses, tetroses, pentoses and hexoses; concept of chiral center; chirality, enantiomers, diastereomers; DL notation; optical activity. iii. Cyclic Structure of hexoses such as glucose and fructose. iv. Glycosidic bond, alpha and beta glycosidic linkage. v. Structure of maltose, sucrose and lactose. vi. General structure of starch and cellulose. Assignment
13	Amino acids and proteins i. Amino Acids and their types with structures. ii. Acid-Base Properties of Amino Acids. iii. Peptide bond; Polypeptides and Protein. iv. Structure of proteins.
14	Lipids i. Fats and oils and their structures. ii. Triglycerides structures. iii. Phospholipids structures. Quiz
15	Revision/ recapping; problem solving; discussion.
16	Final examination

Textbook / Reading Material:

Organic Chemistry by David Klein related chapters and Organic Chemistry by Brown and Foote related chapters will be used as primary textbooks: Relevant chapters and topics will be indicated in the class. Organic Chemistry by Solomons, and Organic Chemistry by McMurray, and other similar books should be used for further reading.

Topics for Presentations:

Presentations will be soon after the Mid Term; the topics and schedule will be explained in the class.

Assignments must be submitted on time otherwise they will not be evaluated.

Class Participation will include attendance, and your active role in learning process such as to ask a **thought-provoking** question related to the topic under study or sharing your difficulties in study with me in or out of class.

Grading system:			
Raw score %	GPA	Letter grade	Remarks
93 – 100	4.00	A	Excellent
90 – 92	3.70	A-	
87 – 89	3.30	B+	
83 – 86	3.00	B	Good
80 – 82	2.70	B-	
77 – 79	2.3	C+	
73 – 76	2.00	C	Satisfactory
70 – 72	1.70	C-	
67 – 69	1.30	D+	
60 – 66	1.00	D	Pass
59 and below	0.00	F	Fail