Course Specifications

General Information

Course name	Organic Chemistry(1)
Course number	PHCH1303
Faculty	
Department	
Course type	Major Needs
Course level	1
Credit hours (theoretical)	3
Credit hours (practical)	0
Course Prerequisites	

Course Objectives

1 - To develop an understanding and appreciation of both structure and chemical transformations of organic molecules.

2 - To bring the student to a good knowledge on structure and reactivity of the most important aliphatic functional groups.

3 - Students will acquire basic concepts of electronic structure and be able to apply them to solve problems from various areas of organic chemistry, including nomenclature, stereochemistry, reactivity patterns and synthesis.

4 - Improvements in learning strategies, critical-thinking, and problem-solving skills are an expected outcome.

5 - To provide a level education, establishing a broad knowledge base and experience in organic chemistry and its life applications

6 - Upon successful completion of this course the students can now demonstrate knowledge of the basic concepts of pharmaceutical organic chemistry effectively

Intended Learning Outcomes

Knowledge and Understanding	* The student should be able to define the basic principles of pharmaceutical organic chemistry especially ; aliphatic compounds such alkanes, alkenes, alkynes, alkyl halides, alcohol, thiols, ethers, sulfides as well as having a strong mentality towards nomenclature and stereochemistry * The student should be able to define the physicochemical such as solubility, lipophilicity, hydrophilicity, hydrophobicity, acidity and basicity concepts * The student should be able to define chemical reactions mechanisms and their applications in synthesis of simple medical organic agents * The student should be able to apply the gained basic to identify the type of reactions, to deal with stereochemistry
Intellectual Skills	* The student should be able to apply the gained basic information to formulate and suggest the methods of synthesis and conclude properties of medicinal agen
Professional Skills	* The student should be able to apply professional skills in synthesis and analysis of different pharmaceutical organic compounds * The student should be able to Write down and discuss results and able to choose and implement perfectly the proper routes during practical work
General Skill	* Communication skills, covering both written and oral communication * Information-retrieval skills, in relation to primary and secondary information sources, including on-line computer searches. * Information-technology skills such as internet communication during using and browsing specific website

Course Contents

1 - Week 1-2 (Introduction and Revision) • Definition of organic chemistry • Role of organic chemistry in different fields of life; (pharmacy, biochemistry, agriculture, industry, analysis, ...etc) • Periodic table and some important terms [electronic configuration, electronegativity, polarity, bond types ionic, covalent and metallic, sigma ? and pi ? bonds; [single, double and triple bonds], intermolecular forces ion dipole, hydrogen bonding, dipole-dipole and Van der Waals, hybridization and molecular geometry, nucleophile, electrophile, solubility solvation and solvolysis, fat soluble vitamins and water soluble vitamins • Oxidation and reduction in organic chemistry • An overview of organic reactions Substitution, Elimination, Addition and Rearrangement • Intermediates [carbocation, carbanion and free radical] • Representation of chemical structure • Functional groups • Isomerism • Acidity and basicity • Inductive and resonance mesomeric effects

2 - Week 3-4 (Alkanes and Cycloalkanes) • Physical properties • Nomenclature • Preparation (Corey-House coupling and Grignad reagent hydrolysis) • Stereochemistry (conformations of alkane eclipsed, staggered, gauch and twisted, boat and chair for cyclohexane , 1,3-diaxial interaction, cyclopropane angle strain and banana bond • Reactions (Halogenation via Free Radical Substitution)

3 - Week 5-6 (Alkenes, Dienes and Cycloalkenes) • Physical properties • Alkenes containing bio-compounds • Nomenclature • Preparation (dehydration of alcohols, dehydrohalogenation of alkyl halides) • Reactions (electrophilic addition; [Markovnikov and Anti Markovnikov rules), halogenation, hydration, hydroboration, oxymercuration, Hydroxylation syn and anti and Diels- Alder cycloaddition • Oxidative cleavage and reduction • Applied synthesis

4 - Week 7 (Alkynes) • Physical properties • Terminal, non terminal alkynes, alkyne acidity and acetylide anions • Alkynes containing bio-compounds • Nomenclature • Preparation (di-dehydrohalogenation of vicinal or geminal alkyl dihalides) • Reactions (oxidative cleavage, reduction, electrophilic addition HX and X2 alkylation of acetylide aninons and hydration • Applied synthesis

5 - Week 8 (Stereochemistry) • Definition • Importance of stereochemistry in pharmacy • Chirality for carbon and other carbon compounds • Optical activity (Levo and Dextroroatory features) • Diastereomers and Enantiomers • Meso compounds • Racemate (racemic mixture) • Configuration (R and S) • Threo and Erythro • Epimers and Anomers • Application Week 9 (Alkyl halides) • Physical properties • CFC and ozone layer • Alkyl halides containing bio-compounds • Nomenclature • Preparation (free radical halogenation of alkane and allylic halogenation of alkenes) • Reactions (Grignard Reagent preparation, Corey-House, Elimination E1 and E2, Nucleophilic Substitution SN1 and SN2 . 4 -

6 - Week 9 (Alkyl halides) Physical properties, CFC and ozone layer Alkyl halides containing bio-compounds, Nomenclature, Preparation (free radical halogenation of alkane and allylic halogenation of alkenes), Reactions (Grignard Reagent preparation, Corey-House, Elimination E1 and E2, Nucleophilic Substitution SN1 and SN2

7 - Week 10-11 (Alcohols and Thiols) • Physical properties • Alcohols or thiols containing bio-compounds • Nomenclature • Preparation (hydration of alkenes, oxymercuration, hydroboration, hydroxylation of alkyl halides, reduction of carbonyl compounds using different reducing agents LiAlH 4, NaBH4 and Grignard reagents). • Reactions (alkoxide formation and Williamson ether and thioether (sulfide) synthesis, dehydration, oxidation using different oxidizing agents PCC, KMnO4, CrO3 • Applied synthesis Week 12 (Ethers, Epoxides and Sulfides) • Physical properties • Chain ether, cyclic ether and crown ether • Ether, Epoxide or sulfide containing bio-compounds • Nomenclature • Preparation • Reactions (cleavage and ring opening) • Applied synthesis Week 13 (Nomenclature) This chapter includes the rules for naming organic compounds contain more than one function group such as (aldheydes, alcohols. Ketones, esters, amides, carboxylic acids, nitriles, …..etc

8 - Week 12 (Ethers, Epoxides and Sulfides); Physical properties, Chain ether, cyclic ether and crown ether, Ether, Epoxide or sulfide containing bio-compounds Nomenclature, Preparation Reactions (cleavage and ring opening) Applied synthesis

9 - Week 13 (Nomenclature), This chapter includes the rules for naming organic compounds contain more than one function group such as (aldheydes, alcohols. Ketones, esters, amides, carboxylic acids, nitriles, …..etc

Teaching and Learning Methods

1 - Tutorials and discussion

2 - learning vedio

3 - Discussion

Students Assessment

Assessment Method	TIME	MARKS
Midterm exam	week no 6	30%
quizzes and home work	distributed among the whole semester	20%
final exam	at week no 14	50%

Books and References

Course note	lecture notes by the lecturer through collection of several books
Essential books	Organic Chemistry by John E. McMurry
	Organic Chemistry by Jonathan Clayden
Recommended books	Synthesis of Essential Drugs by R.S. Vardanyan and V.J. Hruby
	Writing Reaction Mechanisms in Organic Chemistry by Audrey Miller
Other References (Periodical, web sites, ... etc.)	www.khanacademy.org
	http://www.ochem.com/