

# Introduction to Organic Chemistry

## CHEM 108

Credit hrs.: (3+1)

King Saud University

College of Science, Chemistry Department

### Syllabus

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### Introduction

Types of chemical bonds: (*ionic and covalent bonds*) - Atomic and molecular orbital: (*sigma and pi bond*) - Hybridization ( $sp^3$ ,  $sp^2$ ,  $sp$ ) - Inductive effect, polarization, and Stability of carbocation's - Classification of organic compounds and functional groups.

**Lectures (3 h)**

### Aliphatic Hydrocarbons

Classes of hydrocarbons: (*saturated and unsaturated*) - Nomenclature: (*IUPAC and common names*) - Isomerism: (*Structural and Geometrical*) - Physical properties of aliphatic hydrocarbons - Preparation of saturated hydrocarbons (Alkanes): (*Hydrogenation of unsaturated hydrocarbons - Hydrolysis of alkyl Grignard reagent - Reaction of lithium dialkyl cuprates with alkyl halides*) - Reactions of saturated hydrocarbons: (*Halogenations*) - Preparation of Unsaturated hydrocarbons: (Alkenes and Alkynes): (*Elimination reactions (Dehydration, dehydrohalogenation and dehalogenation reactions) and Saytzeff rule*) - Reactions of Unsaturated hydrocarbons: (*Electrophilic addition reactions (Markovnikov's rule), hydrogenation, halogenation, hydrohalogenation, and hydration - Oxidation reactions - Acidity of alkynes*).

**Lectures (12 h)**

### Aromatic compounds

Aromaticity: structure and bonding requirements and Hückel's rule - Nomenclature of aromatic compounds - Electrophilic aromatic substitution reactions: (Alkylation, acylation, halogenations, nitration and sulfonation) - Effects of substituents on electrophilic aromatic substitution reactions - Side-chain reactions: (Oxidation of alkylbenzenes).

**Lectures (4 h)**

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# Syllabus

## Organic halides

IUPAC nomenclature, classification, Physical properties, Synthesis (alcohols with  $PX_3, PX_5, SOCl_2$ ), Grignard reagents, Nucleophilic substitution (-CN, HO-,  $NH_3, \dots$ ).

**Lectures (2 h)**

## Alcohols, Phenols and Ethers

Structure, classifications and nomenclature - Physical properties - Preparation of alcohols and phenols: (Hydration of alkenes - Nucleophilic substitution reaction of alkyl halides - Reduction of aldehydes, ketones and acids - Addition of Grignard compounds to aldehydes and ketones) - Preparation of Phenols: (Benzene sulfonic acids) - Preparation of ethers (Williamson synthesis) - Reactions of Alcohols, Phenols and Ethers: (Salt formation of alcohols and phenols (Acidity of phenols and Reaction of Alcohols with Sodium metal) - Reactions of Alcohols and Ethers with Hydrogen halides - Conversion of Alcohols to alkyl halides - Oxidation of alcohols - Electrophilic substitution reactions of phenols).

**Lectures (6 h)**

## Aldehydes and Ketones

Structure and Nomenclature - Physical properties - Preparation of aldehydes and ketones: (Hydration of alkynes - Ozonolysis of alkynes - Friedel-Crafts acylation - Oxidation of alcohols) - Reactions of aldehydes and ketones: (Nucleophilic addition reaction (addition of hydrogen cyanide, Reduction, Grignard addition, addition of Alcohol (hemiacetal and acetal Formation), addition of ammonia and amine derivatives).

**Lectures (6 h)**

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# Syllabus

## Carbohydrates

Definitions and Classification (*monosaccharides, disaccharides and polysaccharides*) – Monosaccharides: (*Nomenclature - Structure (Optical isomerism, cyclic structure, Fischer Projection, Haworth Formulas)*) - Reactions of Monosaccharides: (*Reduction and oxidation of monosaccharides*) – Disaccharides: (Maltose, Cellobiose, Sucrose and Lactose) – Polysaccharides: (Cellulose and Starch)

**Lectures (4)**

## Carboxylic acids and Their Derivatives

Structure and Nomenclature - Physical properties - Acidity of Carboxylic acids - Preparation: (Hydrolysis of nitrile - Carbonation of Grignard reagents) - Reactions of carboxylic acids: (Salt Formation - Ester, amide, anhydride, and acid chloride formation).

**Lectures (4)**

## Fats and oils

Lipids, fatty acids, waxes, Fat and health, Saponification process, Phospholipids, Chemical Structure: (General structure (Nucleoside, Nucleotide and Nucleic acids) - DNA; structure - RNA; structure and types).

**Lectures (2)**

## Amines

Structure of amines - Nomenclature of amines - Physical properties of amines - Basicity of amines - Preparation of amines: (Reduction of nitro compounds, nitriles and amides - Alkylation of ammonia) - Reactions of amines: (Sulfa drugs - Diazonium salts (Formation and Replacement reactions)

**Lectures (2)**

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## Schedule of Assessment Tasks During the Semester

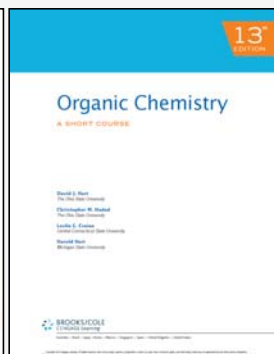
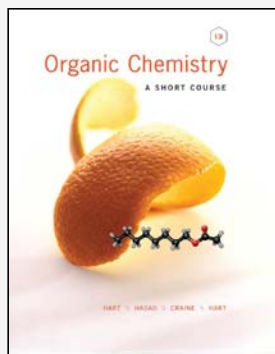
Assessment task	Week Due	Proportion of Total Assessment
1. Lab	All weeks	30 %
2. Home work & Projects	All weeks	10 %
4. 1 <sup>st</sup> Midterm exam	7	10 %
5. 2 <sup>nd</sup> Midterm exam	13	10 %
<b>6. Final exam</b>	<b>16</b>	<b>40 %</b>

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## References

- ❑ *Organic chemistry: A short course* by I Harold Hart, David J. Hart and Leslie E. Craine, Houghton Mifflin Company, USA, 2012.
- ❑ *Elements of Organic Chemistry (second edition)* is written by Isaak Zimmerman and Henry Zimmerman and published by Macmillan Publishing Co., Inc. New York in 1983.

❑ أسس الكيمياء العضوية - أ.د./ سالم بن سليم الذياب - الناشر: مؤسسة نافثة



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## ضوابط الاختبار البديل

شروط عقد اختبار بديل للطالب:

يمكن أن يعقد للطالب -الذي يتغيب عن الاختبار الأساسي -اختبار بديل وفقاً للشروط والضوابط التالية:

- 1- ألا يكون الطالب قد دخل الاختبار الأساسي للمقرر.
- 2- ألا يكون الطالب محروم في المقرر.
- 3- أن يتقدم الطالب بطلب الاختبار البديل في موعد لا يتجاوز أسبوع من عقد الاختبار الأساسي وذلك لعامة السنة التحضيرية (فقط) وليس لمدرس المقرر .
- 4- أن يتقدم الطالب بعذر يقبله مجلس العمادة.
- 5- أن تكون الأعذار من جهات حكومية أو مصدق عليها من جهة حكومية.
- 6- لا يوجد اختبار بديل للاختبار البديل