

Benghazi University
Faculty; Pharmacy
Department; Pharmaceutical chemistry

Course title; Organic Chemistry

Course Specifications;

Program on which the course is given;

Academic year / level; 1st.year

Date of course specification approval;

1. Basic Information;

Title; Organic Chemistry I **Code;** **Credit hours;**(4hours)

Lecture; (2hrs) **Tutorial;** (1hr) **Practical;** (2hrs) **Total;** (4-5) hours/week

2. Course Objectives;

2.1. To provide a stronger background in organic chemical principles that is particularly important to organic chemistry, drugs molecules and pharmacy studies..

2.2. To develop an appreciation for the difficult task of judging the methods of experimental techniques, synthesis, identification of different functional groups in organic and drugs molecules and how to sharpened it by the application of practical experiments.

2.3. To develop wide range of techniques that are useful in modern organic chemistry and using different methods for study chemical and physical properties of organic molecules and their functional groups.

2.4. To know how we can synthesis of different organic molecules related to drugs molecules and study their physical and chemical properties and reach their identifications by different methods "classical and modern".

2.5. To know the relation between the biological molecules and the chemistry of life since carbon atom is the main skeletal in the structure of most biological molecules such as DNA, RNA and carbohydrates molecules which are considered as heart of drugs molecules.

3. Intended Learning Outcomes (ILOs);

a. Knowledge and understanding;

a.1. Described different schemes for the chemical and physical properties with synthesis of the different organic molecules.

a.2. Describe different functional groups in organic molecule and their chemical reactions and how can reaching building of different organic and drugs molecules through chemical synthesis.

a.3. Study principles and application of different classes of organic molecules that related to studies of pharmaceutical science.

b. Intellectual Skills;

b.1. Study chemical and physical properties of different organic molecules and methods of their synthesis.

b.2. Select suitable methods for synthesis and evaluation the structure of different organic molecules and their functional groups through the data of analysis.

c. Professional and practical Skills;

c.1. Apply the given schemes for studies properties of different functional groups in drugs and organic molecules.

c.2. Design schemes for the synthesis and identification of different organic molecules drugs analogs.

d. General and Transferable Skills;

d.1. Integration of different field of knowledge.

d.2. Problem solving.

d.3. Team work.

d.4. independent learning.

4.A. Theory contents;

No	Topic	No. of hours
1.	<p>❖ Introduction to chemistry of aliphatic compounds.</p> <p>(i) saturated hydrocarbons(alkanes, Methane and higher alicyclic hydrocarbon); (3hrs)</p> <p>-structure, hybridization , bonding and classification, physical properties, sources. -- preparation(hydrogenation of alkenes, reduction of alkyl halides, coupling), -Reaction(oxidation and chlorination of methane, halogenations (selectivity and specificity , combustion and pyrolysis).</p> <p>(ii) Unsaturated Hydrocarbons (7hrs)</p> <p>A. alkenes (including dienes and alicyclic) .</p> <p>--Structure,classification,physical properties, sources. --Preparations of alkenes;(dehydrohalogenation E1/E2 mechanism,dehydrationE2/E1mechanism,dehalogenation, reduction of alkynes). --reactions (electrophilic and free radical additions., -,conjugated in dienes (allylic radical,carbocation, conjugated. --dienes, nucleophilic substitution allylic substrate (1,2—and 1,4 addition)</p> <p>B-Alkynes;</p> <p>-preparation(dehydrohalogenation of dihalides,acetylide). -Reaction (addition of H₂,X₂,HX and H₂O), reaction as acid (formation of metal acetylide).</p>	(10hrs)
2.	<p>❖ Stereochemistry</p> <p>(A) Isomerism -Constitutional (chain, position, functional groups).</p> <p>(B) Stereo --Conformational(cyclic,and alicyclic) -Geometrical(cis, trans, E,Z, Syn and anti)</p> <p>(C) Optical -(enantiomers, chirality, conditions for chirality,element of symmetry, super and non-super imposable chiral molecules that do not possess a chiral atom, stereochemistry of SN¹,SN²,SNⁱ,racemisation and resolution of enantiomers) .</p> <p>❖ Stereochemistry (stereoselectivity, stereospecificity, stereochemistry of addition reaction of cis , trans, and E₂)</p>	(12hrs)
3.	<p>❖ Alkylhalides.(structure, classification, nomenclature, physical properties).</p> <p>- Preparations (from alcohols, from certainhydrocarbons,addition of HX to alkenes, halides exchange)</p> <p>- Reactions(SN¹,SN²,mechanism of SN1with rearrangement, S_N¹ vs S_N²)</p>	(3hrs)
4.	<p>❖ Alcohols and Ethers</p> <p>A-Alcohols (4hrs)</p> <p>(structure and nomenclature, physical properties, industrial sources) -Preparation (Oxymercuration –deoxymecuration, hydroboration,Grignard synthesis, hydrolysis of alkyl halides, reduction o carbonyl compounds, reduction of acid and esters, hydroxylation of alkenes) - Reactions, (with HX, with phosphorous halides,dehydration, with acid, Ester formation, oxidation).</p> <p>B. Ethers -(structure and nomenclature, physical properties).</p>	(6hrs)

5.	<p>- Preparation(Williamson synthesis, Lkoxy mercuration/ demercuration). - Reactions (Cleavage by Acids) .</p> <hr/> <p>❖ Aldehydes and Ketones (structure and nomenclature, physical properties, industrial sources). -Preparation(oxidation of primary alcohols, reduction of acid chloride, reaction of acid or esters and halides with organo-metalic ,compounds) -Reactions (oxidation of aldehydes, haloform reactions, reduction, reduction amination, cyanohydrine formation, addition of ammonia derivatives, acetal and hemiacetal formation, addition of Grignard reagent, halogenations of ketones, addition of carbanion).</p>	(5hrs)
6.	<p>❖ Carboxylic acids and acids derivatives. (structure and nomenclature, physical properties, industrial sources). -Preparation (oxidation of primary alcohols, Carbocation of Grignard reagent,(Hydrolysis of nitrile and acid derivatives). -Reactions (Salt formation, Conversion into acid derivatives;(acid halides, acid anhydrides, esters, amides), reduction,alpha-halogenation).</p>	
7.	<p>-Dicarboxylic acids (structure, and nomenclature, Acidity (PH, Pka), preparation). -Acids derivatives; reactions(ammonolysis, alcoholysis, hydrolysis formation of ketones, reduction for the formation of alcohols or amines..etc).</p> <hr/>	(6hrs)
8.	<p>❖ Aliphatic amines(structure, nomenclature, physical properties) -preparations(reduction of aliphatic amides, reaction of halides with ammonia, reduction of nitriles, Hoffmann degradation of amides,) -Reactions(alkylation, basicity (salt formation)).</p> <hr/>	
	<p>❖ Chemistry of Carbohydrates. -Definition and classification(aldoses, ketoses, D, L configuration). -Configuration of monosaccharides. -chemical reactions (oxidation with Tollen, fehling, bromine water ,nitric acid and periodic acid), reduction,ozsazone formation,Epimers formation,) -Synthesis(Ascending and descending). Cyclization in monosaccharides(Haworth and conformation formula, anomers,mutarotation,determination of ring size,determination of absolute configuration.) -Introduction of Di and polysaccharides.</p>	(2hrs)
		Total (50hrs)

4.B. Practical contents;

Organic Chemistry Experiments Organic chemistry I First Year	
Topics	No. of hour (3hrs) for each experiment.

<p>1. Introduction.....</p> <p>2. Safety.....</p> <p>3. Toxicity.....</p> <p>4. Some common chemical poisons and the symptom they induce...</p> <p>5. First Aids.....</p> <p>6. Regulation.....</p> <p>7. Glass Ware and Apparatus</p> <p>8. Experiment Techniques Determination of Melting Point(First experiment)</p> <ul style="list-style-type: none"> ◆ Criteria of Purity (Solid compounds)..... ◆ General technique for melting-point determination..... ◆ Identification by Mixed Melting- points..... <p>9. Determination of Boiling- point (Second experiment)</p> <ul style="list-style-type: none"> ◆ Simple distillation..... ◆ Semi-micro technique <p>10. Purification Methods for organic solid compounds:</p> <ul style="list-style-type: none"> ◆ Crystallization; (Third experiment) ◆ The most desirable characteristic of a solvent for crystallization. ◆ Sublimation (Fourth experiment) <p>11. Purification Methods for Liquid organic compounds:.....</p> <ul style="list-style-type: none"> ◆ Distillation Methods... (Fifth experiment).. ◆ Simple Distillation..... ◆ Fractional Distillation: ◆ Steam Distillation ◆ Vacuum Distillation <p>12. Extraction (Sixth experiment)</p> <ul style="list-style-type: none"> ◆ Separation of Acidic, Neutral, and Basic Substances; ◆ Salting out: <p>13. One and Multisteps Synthesis</p> <ul style="list-style-type: none"> ◆ Synthesis of Aspirin(Acetyl salicylic acid) (Seventh experiment) ◆ Preparation of soap and detergent; (Eight experiment) 	
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5. Teaching and Learning Methods;

(All methods below can be used)

5.1. Presentation .

5.2. Data show .

5.3. Tutorial.

6. Student Assessment methods;

a. Assessment methods;

1. **MSQ** Assessment 1 to assess information of 10 weeks study.
 2. **MSQ** Assessment 2 to assess information of 20 weeks study

b. Assessment schedule;

Assessment 1 10 weeks

Assessment 2 20 weeks

c. Weighing of Assessments;

Assessment Examination: 40 marks/200

Final Examination; 120marks/200

Oral Examination None

Practical Examination 40marks/200

Other types of examination -----

200 marks Total 100%

7. List of References;

No.	Reference	Type
I	<p>a1. Morrison and Boyd, Sixth Edition 1992 (Organic chemistry). <i>(theory)</i></p> <p>a2. (Introduction to organic chemistry) by A. Streitwieser and C.H. Heathcook, 4th.ed., 1992. <i>(theory)</i></p> <p>b1. Pavia, Lampan and Kriz, ((Introduction to organic laboratory techniques)), 3rd.ed., 1988. (Practical)</p> <p>b2. Practical organic chemistry, Vogel's 5th.1989. (practical)</p>	textbook
II	<p>a. Graham Solomon's Craig Fryhle,(organic chemistry)7th.2002. (theory).</p> <p>b. Williamson k.L. and Fieser L.F Organic experiments 6th. Ed. 1967. (Practical)</p> <p>c. Silverstein R.M , Bassler G.C, and Morrill T.C., Spectrometric, Identification of organic compounds ,1991 (Practical)</p>	periodical

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Head of Department;Dr. Ruwida snini edited / 2018-2019