



UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze Agrarie, Alimentari e Forestali
ACADEMIC YEAR	2017/2018
BACHELOR'S DEGREE (BSC)	VITICULTURE AND OENOLOGY
SUBJECT	ORGANIC CHEMISTRY
TYPE OF EDUCATIONAL ACTIVITY	A
AMBIT	50126-Discipline chimiche
CODE	01933
SCIENTIFIC SECTOR(S)	CHIM/06
HEAD PROFESSOR(S)	MAGGIO ANTONELLA Professore Associato Univ. di PALERMO MARIA
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	90
COURSE ACTIVITY (Hrs)	60
PROPAEDEUTICAL SUBJECTS	01900 - GENERAL AND INORGANIC CHEMISTRY
MUTUALIZATION	
YEAR	1
TERM (SEMESTER)	2° semester
ATTENDANCE	Mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	MAGGIO ANTONELLA MARIA Monday 12:00 13:00 Studio del docente Viale delle Scienze edificio 17 - piano 0 - Studio 0/D28

DOCENTE: Prof.ssa ANTONELLA MARIA MAGGIO

PREREQUISITES	General and Inorganic Chemistry knowledge
LEARNING OUTCOMES	<p>Acquisition of useful basic knowledge to understand the role of the organic molecules in the chemical and biochemical processes.</p> <p>Ability to understand the behavior of the most simple organic molecules, through a thoughtful learning and not mnemonic, so as to apply it and to extend also to more complex molecules of synthetic and natural origin.</p> <p>To be able to predict the properties and reactivity of complex organic molecules and their relationship with environmental resources.</p> <p>Ability to describe the properties and the reactivity of the organic molecules according to the structure.</p> <p>To know how deepen with the consultation of scientific texts and journals. Ability to understand chemical and biochemical processes involving such organic molecules.</p>
ASSESSMENT METHODS	<p>Written test articulated in exercises with increasing difficulties aimed at evaluating the knowledge and skills of understanding and applying the knowledge. The oral examination evaluates the autonomy of judgment and the acquisition of the proper language of the discipline.</p> <p>The evaluation will be based on the written test and, optionally, at the discretion of the student, even on the oral test.</p> <p>The final evaluation is graduated taking into account:</p> <p>A) Basic knowledge of the concepts of organic chemistry principles and limited ability to apply them autonomously to the cases discussed during the interview (grades 18-21);</p> <p>B) Good knowledge of the lessons learned and discrete ability to apply them autonomously to the cases presented during the examination (vote 22-25);</p> <p>C) Knowledge of the theory and ability to apply it to the proposed cases, even if not completely autonomous (grades 26-28);</p> <p>D) Knowledge of the theory and ability to apply it promptly and correctly to the proposed cases, excellent expression properties (vote 29-30L)</p>
EDUCATIONAL OBJECTIVES	To provide students with the knowledge and tools to understand the reactivity of organic compounds present in living organisms in soil and agro-food products in order to be able to predict the behavior and the destiny.
TEACHING METHODS	Frontal lessons and exercise
SUGGESTED BIBLIOGRAPHY	<p>- appunti dalle lezioni</p> <p>1Brown W. H., Poon T. –Introduzione alla Chimica Organica, 5a edizione. EdiSES</p> <p>2McMurry J., 2009. Chimica Organica, 7a edizione. Editore Piccin</p>

SYLLABUS

Hrs	Frontal teaching
1	Introduction to the course, mode of performing, mode of examination
5	<p>Review of Lewis Bonding Theory: Ionic Bonding; Covalent Bonding; Multiple Bonding; Formal Charge</p> <p>Short-Hand for Chemists: Line-Angle Formulas; Dashes and Wedges; Curved Arrow Formalism</p> <p>Resonance: Drawing Resonance Structures; Energy of Resonance Structures; Structure and Reactivity from Resonance</p> <p>Review of Molecular Orbital Theory: Atomic Orbitals; Sigma-Bonding; Pi-Bonding; VSEPR Theory</p> <p>Hybridization/LCAO: sp Hybridization; sp² Hybridization; sp³ Hybridization</p> <p>Properties of Molecules</p> <p>Acidity of Organic Molecules: Bronsted–Lowry Acidity; Review of Acid/Base Equations; Acidity Trends;</p> <p>Attached Atom: electronegativity, size and charge; Inductive Effects; Hybridization; Resonance</p>
5	Alkanes: Molecular Formulas; Degrees of Unsaturation; Constitutional Isomers; IUPAC Nomenclature; Conformational Analysis: Newman Projections; Cycloalkanes: Ring Size and Strain: Conformational Analysis; Drawing Chairs; Ring Flip; Mono-Substituted Cyclohexane; Axial versus Equatorial; Di-Substituted Cyclohexane; Cis/Trans Isomerism;
2	Stereochemistry: Stereoisomers; Chirality and Stereocenters; Enantiomers; Cahn–Ingold–Prelog Convention (R/S); Optical Activity; Description of Samples (Optical Purity/Enantiomeric Excess); Diastereomers; Cis/Trans Isomers (Geometric); Molecules with >1 Stereocenter; Fischer Projections
3	Substitution and Elimination Reactions of Alkyl Halides: Alkyl Halides: Nomenclature and Structure; Substitution/Elimination; SN ₂ : Substitution Nucleophilic Bimolecular; SN ₁ : Substitution Nucleophilic Unimolecular; Carbocations; SN ₁ versus SN ₂ ; E ₁ : Elimination Unimolecular; E ₁ versus SN ₁ ; E ₂ : Elimination Bimolecular; E ₁ versus E ₂ ; Substitution versus Elimination
4	Structure and Synthesis of Alkenes: IUPAC Nomenclature; Structure; Synthesis of Alkenes; Dehydrohalogenation (E ₁ and E ₂); Dehalogenation; Dehydration of Alcohols
	Structure and Synthesis of Alkynes: IUPAC Nomenclature; Structure; Acidity
3	Structure of Aromatic Compounds: IUPAC and traditional nomenclature; Structure; Acidity

SYLLABUS

Hrs	Frontal teaching
5	Aliphatic and aromatic alcohols. IUPAC nomenclature. hydrogen bond in alcohols. Acidity of alcohols. Conversion of alcohols into alkyl halides. Acid-catalyzed dehydration of alcohols to alkenes. Oxidation of primary and secondary alcohols. Biological oxidation of ethanol. Ethers. Thiols.. Phenols: Acidity. Oxidation. Polyphenols.
3	Aldehydes and Ketones: IUPAC nomenclature; Reactions of Aldehydes and Ketones; Nucleophilic addition; Oxidation; Acidity of alpha-H; Keto-enol tautomerism
6	Carboxylic acids and derivatives. IUPAC nomenclature. Structure and physical properties. Acidity of carboxylic acids. Effect on acidity of the type and position of substituents. Preparation of the aliphatic carboxylic acids. Decarboxylation of dicarboxylic acids and keto acids. Nucleophilic substitution acyl. Carboxylic acid derivatives and their reactivity. Fischer esterification. Basic and acid hydrolysis of esters. Transesterification reactions. Thioesters: acetyl CoA.
2	Organic compounds containing nitrogen: Amines. Nomenclature and Structure. Basicity of aliphatic amines, aromatic and heterocyclic. Reductive amination of aldehydes and ketones
4	Carbohydrates. Classification of carbohydrates. Fischer projections. Monosaccharides D, L. cyclic structure of monosaccharides. Mutarotation. Oxidation and reduction of monosaccharides. Glycosides synthesis. Amino sugars. Glycosidic bond. Disaccharides (cellobiose, maltose, lactose, sucrose). Polysaccharides (cellulose, starch). Deoxy sugar. Amino acids: acid-base classification and properties. isoelectric point. Reductive amination of alpha-keto acids. Transamination reaction. Amide bond, and disulfide bond. Lipids. Physical and chemical properties. Saturated and unsaturated fatty acids. Triglycerides. Phospholipids. Waxes. Terpenes.
Hrs	Practice
2	Practice Problems: Structure and nomenclature of Alkanes and cycloalkanes.
2	Practice Problems: Stereochemistry
2	Practice Problems: Structure and nomenclature of Alkenes. Substitution/Elimination
2	Practice Problems: Structure and nomenclature of Alcohols. Properties
2	Practice Problems: Structure and nomenclature of Aldehydes and Ketones. Properties
2	Practice Problems: Structure and nomenclature of Carboxylic acids and derivatives. Properties
2	Practice Problems: Structure and nomenclature of amines. Properties
4	Practice Problems: Structure and nomenclature of carbohydrates, amino-acids and lipids.