



UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze Agrarie, Alimentari e Forestali		
ACADEMIC YEAR	2017/2018		
BACHELOR'S DEGREE (BSC)	AGRI-FOOD SCIENCES AND TECHNOLOGIES		
SUBJECT	ORGANIC CHEMISTRY		
TYPE OF EDUCATIONAL ACTIVITY	A		
AMBIT	50132-Discipline chimiche		
CODE	01933		
SCIENTIFIC SECTOR(S)	CHIM/06		
HEAD PROFESSOR(S)	BRUNO MAURIZIO	Professore Ordinario	Univ. di PALERMO
OTHER PROFESSOR(S)			
CREDITS	6		
INDIVIDUAL STUDY (Hrs)	90		
COURSE ACTIVITY (Hrs)	60		
PROPAEDEUTICAL SUBJECTS			
MUTUALIZATION			
YEAR	1		
TERM (SEMESTER)	2° semester		
ATTENDANCE	Not mandatory		
EVALUATION	Out of 30		
TEACHER OFFICE HOURS	BRUNO MAURIZIO Tuesday 12:00 14:00 Edificio 17 Thursday 12:00 14:00 Edificio 17		

DOCENTE: Prof. MAURIZIO BRUNO

PREREQUISITES	General Chemistry
LEARNING OUTCOMES	KNOWLEDGE AND ABILITY OF COMPREHENSION Acquisition of knowledge of the structure and reactivity of organic compounds. Ability to use the specific language of this discipline CAPACITY TO APPLY KNOWLEDGE AND COMPREHENSION Ability to be able to determine the relationships between structure, physical properties and chemical reactivity of organic compounds also multifunctional. MAKING JUDGMENTS To be able to interpret and rationalize the organic reactions in terms of reaction mechanism, based on the fundamental structure / reactivity correlations, using a methodological scientific approach. ABILITY OF COMMUNICATION Ability to expose the reasons for the use of certain products and to highlight the negative effects of any erroneous procedures. LEARNING CAPACITY: Upgrade skills by consulting the industry's own scientific publications. Ability to follow, using the knowledge gained in the course, subsequent courses concerning both food analysis and specific procedures for proper use and conservation.
ASSESSMENT METHODS	The evaluation of student learning requires the possession of the skills and knowledge of the subject matter of the course as well as the ability to apply them to problems related to ailments. In addition, it verifies the possession of property of scientific language and of exposure capacity. The final examination consists of a written test. The written test, of the duration of about 2 hours, consists of several different types of open response exercises: 1) Organic compounds reactions (three / five exercises, up to 1 point each); 2) Description of reaction mechanisms (two exercises, up to 3/5 points each); 3) Nomenclature of organic compounds (three / five exercises, up to 1 point) 4) Absolute configuration exercises (one exercise up to 3) 5) Exercises on bio-molecules (two exercises, up to 3/5 points each) 6) Degeneration, modification and storage of food (two / four exercises, up to 2/4 points each) in order to ensure the learning of the required knowledge. The method of carrying out and evaluating all types of exercises is discussed during the course exercises. The written test is passed when the sum of the individual exercises is higher than 18/30.
EDUCATIONAL OBJECTIVES	The goal is to introduce the student to the principles of Organic Chemistry. The aim is to give a broad basic knowledge on nomenclature, representation, three-dimensional structure and chemical and physical properties of organic molecules with characterization of functional groups and their reactivity. Particular emphasis will be given to organic molecules present in food.
TEACHING METHODS	Teaching takes place in the first half of the year and consists of lectures and of numerical exercises. Classroom exercises are performed to simulate the final examination.
SUGGESTED BIBLIOGRAPHY	Brown – Chimica Organica – EdiSes Dispense di riferimento

SYLLABUS

Hrs	Frontal teaching
2	Introduction - Ionic and covalent bonds. Atomic orbitals. Hybridization. Electronegativity and polarity. Oxidation number. Bond energies. Resonance. Electrophilic and nucleophilic reagents. Acids and bases. Resonance. Isomerism.
2	Alkanes - Nomenclature. Physical properties. Newman projection. Conformational analysis. Relative stability of cycloalkanes: ring strain. conformational analysis. Polycyclic structures.
2	Alkenes – Geometric isomers. Nomenclature. Physical properties. Terpenes. Alkynes. Electrophilic polar addition reactions. Catalysis. Carbocations. Oxidation and reduction. Glicols
2	Alkyl halides - Nomenclature. Physical properties. Nucleophilic displacement.
2	Polymers derived from ethylene. Teflon. Geometry of polymers. Atattic. Isotattic. Polymers derived from dienes. Rubber.
2	Elimination. Alcohols. Ethers. Epoxides. Dehydration of alcohols. Oxidation. Opening epoxides. Polyethers. Phenols. Acidity.
2	Aldehydes. Ketones Nucleophilic addition. Addition of HCN, alcohols, ammonia, hemiacetals, acetals, imines. Reduction of aldehydes and ketones.
2	Carboxylic acids. Acidity. Acylic nucleophilic substitution. Salts. Hydrolysis. Buffers.
2	Esters. Fisher esterification. Ester hydrolysis. Waxes. Polyesters.
5	Lipids. Classifications. Saturated and unsaturated fats. Essential fatty acids. Glycerides. Phospholipids and glycolipids. Waxes. Sterols: cholesterol and phytosterols . Tocopherols and tocotrienols. Transformations of lipids: hydrolysis. Acrolein. Peroxidation: auto-oxidation, photo-oxidation; decomposition of hydroperoxides.
2	Amines: structure and nomenclature. Basicity. Buffers. Polyamides.
2	Benzene. Nomenclature of substituted benzenes. Polynuclear aromatic hydrocarbons.

SYLLABUS

Hrs	Frontal teaching
2	Stereochemistry – Optical isomerism. Specific rotation. Symmetry elements. Chiral molecules. Fisher projection. Enantiomers and racemic forms. Relative and absolute configuration. Diastereomers. Meso structures. Chirality and the biological world.
5	Carbohydrates. Structure of monosaccharides. Formulas of structure, stereochemistry. Glycosides: formation and hydrolysis. Monosaccharides: glucose and fructose; glycemic index and sweetening power; galactose, mannose. Disaccharides and trisaccharides, sucrose, lactose, maltose, cellobiose, gentiobiose, trehalose, raffinose, melezitose. Polysaccharides: amylose, amylopectin, glycogen, dextrin, cellulose, carrageenan, agar, alginates, pectins, chitin. Transformations of carbohydrates: heating and caramelization. Non-enzymatic browning; Maillard reaction; compounds of Amadori and Heyns; Strecker reaction.
5	Amino acids. Protein. peptide bond. steric series. Primary, secondary and tertiary. Denaturation. Emulsions, foams, gels. Functional properties. Protein degradation. Putrefaction.
2	The color in foods: main classes of natural pigments: compounds containing heme; carotenoids; flavonoids and other phenolic compounds. Betalains. CEE Labelling of the dyes.
2	Food additives. CEE labelling of additives. preservatives; antioxidants. Regulators of acidity; thickeners, gelling agents and stabilizers .
2	Distillation , azeotropes.
5	Mass spectrometry. The mass spectrometer. Identification of pure compounds using mass spectrometry. Analysis of mixtures with methods combined with mass spectrometry. quantitative applications.
Hrs	Practice
5	Exercises on the functional groups
5	Exercises on mass spectrometry