

UNIVERSITA' DEGLI STUDI MEDITERRANEA DI REGGIO CALABRIA

Subject Code	-----
Subject Name	CHEMISTRY
Professor	MARIA SIDARI - Ricercatore confermato Università Mediterranea di Reggio Calabria
Department:	AGRARIA
Degree course:	SCIENZE E TECNOLOGIE AGRARIE/SCIENZE FORESTALI ED AMBIENTALI
Class:	-----
Type of educational activity:	BASE
Disciplinary Area:	-----
Scientific-Disciplinary Sector:	CHIM 03/06
Compulsory preliminary exams:	-----
Course Year:	I°
Semester:	I°
ECTS:	8
Hours:	80

Synthetic description:

The course is designed to lay the strong foundations for further study in subsequent years (Pedology, Biochemistry and Physiology, Soil Chemistry, Soil ecology, Genetics). The topics considered have been chosen to illustrate the fundamental principles of the chemistry. The topics are presented in a way which cuts across the traditional divisions of the subject so as to show the manner in which widely differing parts of the subject are interrelated.

Organic chemistry comprises a great diversity of structures and functional groups, which can undergo a wide variety of chemical reactions. This course aims to develop a good understanding of those reactions, using the concepts of reaction mechanism.

Acquisition of knowledge on:

Acquisition of an adequate level of scientific literacy. Understanding of the chemistry language (symbols and formulas), the structure of matter and the thermodynamic and kinetic principles that govern its transformation. Understanding of the relationships between structure, properties and reactivity of organic molecules, with particular reference to those of biological importance.

Evaluation method:

Oral examination

Student's independent work

120 hours

Detailed course program

Measurement: SI Units. Errors. Significant figures. Scientific notation

The States of Matter. Elements, compounds, and mixture. Atomic and molecular weight. Periodic table of the elements.

The atom: Structure of the atom. Isotopes. Electrons and chemical periodicity. Orbitals. Pauli principle. Hund principle. Aufbau.

The chemical bond. Binding energy, octet rule, ionization potential, electron affinity, metallic character of an element, the representation of the atoms. Types of chemical bond: atomic, electrostatic, metallic bonds. Electronegativity. Hybridization, resonance. Lewis structures.

Solids and gases: covalent, ionic and metallic compounds. The properties of gases. Gas laws. The ideal gas equation, Deviations from the ideal gas law,

Liquids: Solutions, colloids and suspensions. Units of concentration. Colligative properties

Chemical equilibrium and the prediction of equilibrium constants: Acids and bases, the ionic product for water K_w , pH and pOH, weak acids and bases and their equilibrium constants, acid-base titrations, acid-base indicators, hydrolysis of salts, buffer solutions, solubility product

Electrochemical cells: description in terms of the Nernst equation and applications. the standard electrode potential, redox reactions, redox equilibria, electrolysis, voltaic cells.

Chemical Thermodynamics: Energy, enthalpy, entropy, the Gibbs energy. First, second and third law of thermodynamics.

Kinetics of Chemical Reactions: mechanism of a reaction and some of the factors that influence it. Rate of reaction, The order of the reaction, catalysis and catalysts, activation energy, Arrhenius law.

Formulas and chemical reactions. Nomenclature, Oxidation numbers. Balancing Chemical Equations. Redox reactions. Synthesis, Decomposition, Substitution, Double Displacement, Acid-Base, Hydrolysis reactions. Balancing Chemical Equations the Law of Conservation of Mass

Inorganic chemistry. General characteristics of each group of the periodic system. Main oxidation states and compounds of the following elements: H, Na and K, Mg and Ca, Al, C and Si, N and P, O, Cl. Noble Gases. Transition metals.

Organic chemistry: Carbon, the electron configuration, hybridisation, σ and π bonds: single, double and triple bond.

Organic reactions: Lewis acids and bases, Electrophilic and nucleophilic reagents, carbocations and carbanions. The basic organic chemistry reaction types: addition reactions, elimination reactions, substitution reactions.

Nomenclature: nomenclature IUPAC and common of functional groups

Stereochemistry: enantiomers and diastereoisomers, epimers. Compounds optically active, configurations and conformations.

Hydrocarbons: Alkanes : physical properties, structure and nomenclature, isomers, reactions.

Alkenes and alkynes: physical properties, structure and nomenclature, Cis–trans and E-Z isomerism, reactions.

Haloalkanes, alcohols, ethers and epoxides: physical properties, structure and nomenclature, reactions, SN reactions

The carbonyl group :

Aldehydes and Ketones: physical properties, structure and nomenclature, reactions.

Carboxylic Acids and their derivatives: physical properties, structure and nomenclature, acidity, reactions, esterification and saponification.

Organonitrogen Compounds: Amines, Amides, physical properties, structure and nomenclature, reactions, urea (carbamide).

Aromatic Hydrocarbons and Their Derivatives: Aromaticity and aromatic Compounds. Electrophilic aromatic substitution, benzene, aromatic ring, aromatic Compounds, nomenclature.

Lipids: Fats (triglycerides) and oils, waxes, sterols, fat-soluble vitamins (vitamins A, D, E, and K), phospholipids, terpenes.

Carbohydrates: monosaccharides, disaccharides, oligosaccharides, and polysaccharides. Structures, classification.

Protein structure and amino acids. Protein primary, secondary, tertiary and quaternary structures.

Resources and main references

Silvestroni Paolo. (1999). *Fondamenti di chimica*. Casa Editrice Ambrosiana, Milano
-Morrison, R.T.; Boyd, R.N. (1985). *Chimica organica*. Casa Editrice Ambrosiana, Milano

-Gillespie Ronald J. et al.(1988) – *Chimica*. Società Editrice Scientifica, Napoli.

-Masterton W.L., Hurley C. L. (1998). *Chimica: principi & reazioni*. Piccin, Padova

-Skoog, D.A.; West D.M., Holler F.J. (1998). *Fondamenti di chimica analitica*. Edises, Napoli.

-Brown, W.H. (2001). *Introduzione alla chimica organica*. EDISES, Napoli

-Brown, W.H. (1996). *Chimica organica*. EDISES, Napoli