UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze Agrarie, Alimentari e Forestali
ACADEMIC YEAR	2023/2024
BACHELOR'S DEGREE (BSC)	MEDITERRANEAN AGRICULTURAL SYSTEMS
SUBJECT	ELEMENTS OF GENERAL AND INORGANIC CHEMISTRY
TYPE OF EDUCATIONAL ACTIVITY	A
AMBIT	50126-Discipline chimiche
CODE	18692
SCIENTIFIC SECTOR(S)	CHIM/03
HEAD PROFESSOR(S)	MARZULLO PAOLA Ricercatore a tempo determinato Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	9
INDIVIDUAL STUDY (Hrs)	135
COURSE ACTIVITY (Hrs)	90
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	1
TERM (SEMESTER)	1° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**MARZULLO PAOLA** Monday 16:30 18:30 Polo Universitario di Trapani, 1°piano.Richiesta la prenotazione tramite email (paola.marzullo@unipa.it) o portale studenti.Il ricevimento puo essere svolto anche online, su piattaforma teams, nel giorno e nell'orario previamente concordati con il docente.

DOCENTE: Prof.ssa PAOLA MARZULLO

PREREQUISITES	Formal prerequisites.
LEARNING OUTCOMES	Knowledge and understanding: Knowledge of the basic principles of modern chemistry. Ability to understand the language of the discipline. Ability to apply knowledge and understanding: Ability to understand and analyze the main phenomena and transformations in chemistry. Application of these skills to simple problems concerning the degree course. Autonomy of judgment: Being able to evaluate the implications and results of chemical phenomena and transformations. Communication skills: Ability to describe chemical phenomenology with the language of the discipline. Learning skills: being able to apply the principles of the discipline as a tool for the interpretation of real phenomena.
ASSESSMENT METHODS	The student will take a written exam concerning i) stoichiometry, ii) organic chemistry exercises iii) a question - in the open form - on the remaining part of the program. Prior to the validation of the final mark, the student will take a quick interview to confirm the written assessment mark. The final evaluation is graded by taking into consideration: a. Basic knowledge of the concepts of chemistry and limited ability to apply them independently (18-21); b. Good knowledge of the concepts developed in class and good ability to present them during the exam (22-25); c. In-depth knowledge of the theory and ability to apply it promptly and correctly to the proposed cases, excellent property of expression (26-29); d. Ability to deepen the issues of the subject with cognitive autonomy (30, 30 cum laude).
EDUCATIONAL OBJECTIVES	The educational objectives of teaching are modulate in order to obtain a proper use of basic general and organic chemistry. The student will know the basic principles of atomic and molecular structure, of chemical bond, of the laws of physical chemical transformation based on the periodic properties of the elements. The student will know also the main classes of organic compounds, synthetic and natural, their main functional groups and their reactivity. Furthermore, the student will develop calculation abilities necessary for common laboratory practice.
TEACHING METHODS	The main teaching approach will be face-to-face lectures during which all the students will be involved in sessions of Q&A thus clearing any doubts rising during the lectures. Tutorials will also take place in order to get the students used to chemistry-based problems which will be faced in the final exam. Lab practicing will help the students in applying the fundamentals of chemistry in a real world.
SUGGESTED BIBLIOGRAPHY	Fondamenti di chimica. Schiavello, Palmisano. Ed. Edises. ISBN: 9788836230716 Chimica - Principi e Reazioni. Masterton, Hurley. Ed. Piccin, VI edizione. ISBN: 9788829920319 Stechiometria. Freni, Sacco. Ed. Edises. ISBN: 9788836230310

SYLLABUS

Hrs	Frontal teaching
3	Matter: international system of units; physical and chemical properties, extensive and intensive properties; mass, volume and density; pure substances and mixtures; phase, homogeneous and heterogeneous systems; elements and compounds; the nuclear atom and subatomic particles; isotopes and atomic weights; atomic mass unit and mole; percent composition, empirical and molecular formulas.
3	Electronic structure of atoms and periodic table of elements. Bohr's atomic model; wave-particle duality; uncertainty principle; hydrogen atomic orbitals; quantum numbers; poly-electron atoms; electron configuration; Aufbau principle; Pauli exclusion principle and Hund's rule; periodicity of physical and chemical properties: atomic and ionic radii, ionization energy, electron affinity; electronegativity.
5	Chemical bonding and molecular structure: binding energy; ionic bond; covalent bond; Lewis structures of diatomic and polyatomic molecules; resonance; formal charge; enthalpy and bond length; bond order; polar covalent bond; molecular geometry of ions and molecules according to the VSEPR model; polar molecules; valence bond theory; hybridization, sigma and pi bonds.
4	Main classes of inorganic compounds: oxidation number; periodic table, periods and groups; formation of molecular and ionic compounds on the basis of the atomic electron configuration; overview of systematic nomenclature; binary compounds with hydrogen and oxygen; hydroxides and oxoacids; salts.
5	Chemical reactions and balanced chemical equations: combustion; chemical reactions in water solution; redox reactions; mass relationships.
4	Gaseous state: ideal gas law; intermolecular forces and real gases; hydrogen bond.
4	Liquid state: properties of liquids; evaporation of a liquid and vapor pressure; Boiling and solidification or melting temperature, phase diagrams.
5	Solutions and their properties: liquid in liquid and solid in liquid solutions; units of concentration; saturation and solubility; gas in liquid solutions: Henry's law; influence of temperature and pressure on gas solubility; colligative properties of electrolytes and non-electrolytes solutions: vapor pressure lowering, freezing point depression, boiling point elevation, osmotic pressure.

SYLLABUS

Hrs	Frontal teaching
4	Chemical equilibrium: law of mass action; equilibria in homogeneous and heterogeneous systems; Kp and Kc; reaction quotient and equilibrium constant; Le Chatelier's principle and its applications.
6	Equilibria in water solution: acid-base equilibrium; Arrhenius, Brønsted-Lowry and Lewis definition of acids and bases; the pH scale; relative strength of acids and bases; acids, bases and salts in aqueous solution; hydrolysis; buffer solutions; acid-base titrations; indicators.
4	Heterogeneous equilibria: solubility and solubility product; distribution equilibria; precipitation and dissolution; common ion effect on solubility; effect of pH and of the formation of complex ions on solubility.
10	Organic compounds. Rules for naming organic molecules. Hydrocarbons, alcohol, ethers, aldehydes and ketones. Carboxylic acids and derivatives. Benzene and aromaticity.
6	Fundamentals of organic chemistry reactions. Main classes of biomolecules.

Hrs	Practice
12	Stoichiometry and organic chemistry exercises.

Hrs	Workshops
15	Safety in laboratories: behavioral methods and correct procedures in the use of chemical products. Analytical instrumentation, dilutions, acid-base titrations. Techniques commonly used in the laboratory: crystallization, distillation, filtration, chromatography, extraction.