CORSI DI STUDIO

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CORSI DI STUDIO DI MEDICINA E CHIRURGIA

LINEE GUIDA

PER LA COMPILAZIONE DELLE SCHEDE INSEGNAMENTO (SYLLABUS)

Documento approvato da PQA nella riunione del 2.05.2023

FAC.SIMILE SCHEDA DI INSEGNAMENTO IN LINGUA INGLESE

COURSE OF STUDY
ACADEMIC YEAR
ACADEMIC SUBJECT

General information	
Academic subject	***General and Inorganic Chemistry***
Degree course	*Sciences for the Valorisation of the Gastronomic Heritage*
Year of the course	*I*
Academic calendar (starting and ending date)	*1st semester (09-10-2023 / 26-01-2024)*
Credits (CFU/ETCS):	*6*
SSD	*CHIM/03*
Language	*Italian*
Mode of attendance	*Not mandatory*

Professor/ Lecturer	
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Department and address	*Department of Chemistry – c/o Dept. of Pharmacy building (1st floor, Room 207); Via E. Orabona 4, 70125 – Bari (Italy)*
Virtual room	*0y3hy7x*
Office Hours (and modalities: e.g., by appointment, on line, etc.)	*Every day by previous email appointment*

Work schedule			
Hours			
Total	Lectures	Hands-on (laboratory, workshops, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
150	*32*	*28 (in-class chemical exercises)*	*90*
CFU/ETCS			
6	*4*	*2*	

Learning Objectives	*The course aims to provide students with the basic knowledge of general and inorganic chemistry necessary to face the subsequent chemical subjects of the degree course. At the end of the course students will know the structure and chemical properties of the elements and their inorganic compounds, of natural and synthetic origin, in their theoretical and applicative aspects. Students will be able to communicate the corresponding information with adequate terminology and in a rigorously scientific manner. Another objective is to provide students with both qualitative and quantitative tools to solve stoichiometry problems for subsequent laboratory practice, to analyze matter with its compounds, properties and chemical transformations, also paying attention to nutritional significance.*
Course prerequisites	*Basic knowledge of chemistry and mathematics (e.g. conversion between units of*

	measurement, first and second degree equations, operations with powers and logarithms). The expected level of preparation corresponds to the ministerial programs of secondary school.

Teaching strategie	*Teaching will be delivered in person through frontal lessons carried out with the aid of PowerPoint presentations and the use of the blackboard. The numerical exercises in the classroom are carried out on the blackboard with the active participation of the students.*
Expected learning outcomes in terms of	
Knowledge and understanding on:	*In-class lectures aim to provide a rigorous chemical learning of the basic knowledge of general and inorganic chemistry: properties, composition, and structure of matter, atomic structure, chemical bond and geometry of molecules, chemical equilibria, basic knowledge of thermodynamics and chemical kinetics, reactivity of elements and compounds, properties of solutions, etc.*
Applying knowledge and understanding on:	*In-class numerical practice involves the acquisition of the basic elements of stoichiometry or the numerical and calculation aspects relating to the simplest chemical concepts and problems. This is done by understanding the text of an exercise, developing a solution strategy, carrying out mathematical and algebraic calculations and identifying and evaluating the chemically correct result. At the end of the course students are able to identify the different types of chemical reactions, write and balance them correctly, evaluate the thermodynamic and kinetic conditions for their feasibility, and confidently use the methods for their quantitative treatment.*
Soft skills	• *Making informed judgments and choices* *By applying the acquired concepts and the correct chemical terminology and the nomenclature of inorganic compounds, students will be able to independently evaluate chemical problems (such as the reactivity of elements and compounds) and to choose the most appropriate approach for solving problems associated with chemical phenomena.* • *Communicating knowledge and understanding* *At the end of the course, during which there will be numerous moments of interaction with the lecturer, students will be able to explain definitions, fundamental concepts and theories learned in a clear and rigorously scientific way and to discuss eventually proposed problems/exercises.* • *Capacities to continue learning* *At the end of the course, students will be able to autonomously investigate issues relating to general and inorganic chemistry, to critically evaluate phenomena and results, and to use them as a basis for addressing subsequent disciplines in the degree course. The general and inorganic chemistry course should also provide the student with a critical view of the importance of chemistry in daily life and for society in general, especially for aspects related to nutrition and its implications on health.*
Syllabus	
Content knowledge	*Characteristics of Matter and Physical properties: base units in the SI system. Phases and transformations of matter. Homogeneous and heterogeneous systems.* *Atomic theory: Atomic and molar masses. Elements and compounds. Atoms, molecules, symbols and chemical formulas.* *Atomic structure: protons, neutrons, electrons. Atomic number. Mass number. Isotopes. Allotropy. Oxidation number. Naming chemical compounds. Mole's definition. Avogadro's number. Molar mass. Mass percent composition. Empirical*

	formula. Chemical reactions. Strong and weak electrolytes. Reduction-oxidation reactions. Precipitation reactions. Chemical reactions and stoichiometry. Balancing chemical equations. Electron transfer reactions. Balancing redox reactions. *Atomic models and periodicity: Rutherford's, Bohr's, and Schrödinger's atomic models. Quantum numbers. Hydrogen atomic orbitals. Polyelectronic atoms. Aufbau principle. Pauli exclusion principle. Hund's rules. Electron configurations. Periodicity of atomic properties, atomic and ionic radii. Ionization energy. Electron affinity. Electronegativity.* *Chemical bonding: Covalent bond. Lewis Structures. Bonding in molecules and poliatomic ions. Resonance structures. Molecular Geometry and V.S.E.P.R. theory. Hybrid Orbitals. Molecular orbitals theory and L.C.A.O. Sigma and pi bonds. Delocalization of molecular orbitals. Bond order. Bond length. Dipole moments. Bond polarizability. Polar molecules. Ionic bond. Metallic bonding. Intermolecular forces. van der Waals' forces. Hydrogen bonding.* *The behavior of gases: Air composition. Boyle's Law. Charles' Law. Normal and STP conditions. Ideal gas equation. Avogadro's law. Dalton's Law of partial pressures.* *Principles of thermodynamics: heat and chemical reactions. Enthalpy. Entropy and measure of disorder. Spontaneity of chemical reactions and Free energy.* *Principles of chemical kinetics: rate of chemical reactions.* *The nature of solutions: measurements of concentration. Effect of temperature on solubility. Ideal solutions. Colligative properties. Vapour pressure of a solution. Raoult's law. Freezing point depression and boiling point elevation (Cryoscopy ed ebullioscopy). Osmosis and osmotic pressure.* *Chemical equilibrium: the equilibrium constant. Direction of an equilibrium reaction (the concentration quotient). Influence of intensive state variables on equilibrium. Shifts in equilibrium. Le Chatelier's principle.* *Aqueous equilibria: acid and base definitions (Arrhenius, Brønsted-Lowry, Lewis). Ionic product for water, pH, pOH, pKw. Acids and bases strength. Acid and base equilibrium constants. Degree of dissociation. Conjugate acid-base pairs. Basic and acidic salts. Polyprotic acids. Amphiprotic species. Acid-base Titrations. Indicators. Buffer solutions.* *Basics of inorganic chemistry: Main group elements. Transition metals. Preparation of top inorganic industrial chemicals.* *Classroom exercises: resolution of exercises relating to the course topics.*
Texts and readings	*- Introduzione alla chimica (VI Edizione): N.J.Tro. Casa Editrice: Pearson.* *- Fondamenti di Chimica Generale (III Edizione): Chang, Overby. Casa Editrice: Mc Graw Hill.* *- Elementi di Stechiometria: Giannoccaro, Doronzo. Casa Editrice: EdiSES.*
Notes, additional materials	*- https://he.pearson.it/catalogo/1238* *- https://www.mheducation.it/fondamenti-di-chimica-generale-3-ed-con-connect-9788838696299-italy* *- https://www.edisesuniversita.it/default/elementi-di-stechiometria.html* *The Lecturer will make lesson notes and course slides available.*
Repository	*Lectures' notes and PowerPoint slides will be downloadable from a Google Drive link provided by the Lecturer.* *Exams' tests will be also available on the UniBa personal page of the Lecturer (https://www.uniba.it/docenti/margiotta-nicola/attivita-didattica). On the web platform TEAMS a team has been created for file sharing.*

Assessment	

Assessment methods	*The exam consists of an oral interview in which the student, in addition to the classic questions relating to theoretical topics concerning general chemistry, will also be given exercises and problems (which require carrying out calculations for resolution) similar to those carried out during the exercises on the blackboard in the classroom during the course. The student will be provided with a periodic table of the elements while the calculator must be proprietary and non-programmable. The use of PCs, tablets, mobile phones and smartwatches connected to the internet is not permitted. The final evaluation is based on the results obtained in the exercises/problems and in the questions purely relating to the theoretical part of the course. A possible intermediate test (written exemption – esonero scritto) will be carried out compatibly with the regular progress of the course. If the written esonero is passed, the student will be able to access the oral session where he will be interviewed only on the part of the exercises carried out after the exemption.*
Assessment criteria	• *Knowledge and understanding* *Students must demonstrate the ability to: discursively organize the knowledge of the main chemistry laws; critically think about the main chemical phenomena; competently expose the topics studied using specialized chemical vocabulary and scientific terminology.* • *Applying knowledge and understanding* *The evaluation of the written exercises will consider correctness of the numerical results together with an explanation of the procedures used to obtain them, scientific coherence between interdependent results and the relative unit of measurement of the physical quantities used.* • *Autonomy of judgment* *Students' ability to deal with a chemical problem will be evaluated, such as the possibility that a chemical reaction may or may not occur.* • *Communicating knowledge and understanding* *The oral interview includes the resolution of exercises and problems of general chemistry, a minimum of three questions on the contents covered during the course.* • *Communication skills* *Evaluation elements of the oral exam are the qualitative and quantitative correctness of the exposed definitions, laws and demonstrations carried out, the degree of depth of the topics as well as students' ability to correlate different aspects of a chemical phenomenon.* • *Capacities to continue learning* *It will be evaluated both by the method of solving chemical problems and answering to theoretical question during the oral interview.*
Final exam and grading criteria	*The final grade is awarded out of thirty. The exam is considered passed when the grade is greater than or equal to 18/30. The resolution of the general chemistry exercises and problems administered during the oral exam will be evaluated with the same criteria adopted for the evaluation of the answers to the questions regarding the theoretical topics.*
Further information	-