UNIVERSITÀ DEGLI STUDI DI BARI ALDO MORO

DIPARTIMENTO JONICO IN "SISTEMI GIURIDICI ED ECONOMICI DEL MEDITERRANEO: SOCIETÀ, AMBIENTE, CULTURE"

General information		
Academic subject	**General and Inorganic Chemistry**	
Degree course	Science and Technical Nautical Management	
Academic Year	1st year (2022-2023)	
European Credit Transfer and Accumulation System (ECTS)		6
Language	Italian	
Academic calendar (starting and ending date)	2nd semester (March 6th – June 10th 2023)	
Attendance	Discretionary, but strongly advised	

Professor/ Lecturer	
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Telephone	
Department and address	
Virtual headquarters	Teams code: wgyev9d
Tutoring (time and day)	All meetings must be arranged with the teacher via e-mail.

Syllabus	
Learning Objectives	The class is intended to provide typical methods and contents of General and Inorganic Chemistry, both at a theoretical and a practical level, applied to a more general technological and environmental scope. About this point, the class represents a fundamental background for a proper comprehension of subsequent chemical and more in general scientific classes. Students will develop a natural awareness of the essential role of chemistry in science and technology, and will acquire familiarity with the fundamental principles of the scientific method. They will learn the specific terminology of the discipline and will be able to recognize the most common inorganic compounds starting from their name or chemical formula. The notions necessary to understand the nature of matter and of materials will be provided throughout the course, as well as the concept of equilibrium, and the kinetic and thermodynamic properties of chemical reactions, particularly in gas phase and in aqueous solution.

Course prerequisites	There are no specific prerequisites, aside from basic math knowledge.
Contents	Introduction. Experimental measures, units of measure. Introductory definitions. Atomic theory of matter. Fundamental laws of Chemistry. Structure of the atom. Isotopes. Atomic and molecular weights. Concept of mole and molar mass. Electronic structure of atoms. Atomic models. Orbitals, quantum number, contour surfaces. Electronic configuration of the elements. Periodic table. Periodic properties. Classification of the elements. Chemical bond. General properties. Ionic bond. Covalent bond, dative bond, radicals, resonance, electronegativity. Band theory. Conductive materials, insulators, and semiconductors. Dipolar interactions and hydrogen bond. Nomenclature. Oxidation number, IUPAC rules and traditional nomenclature of the main classes of inorganic compounds. Chemical reactions. Chemical equations and reactions, limiting reagent, reaction yield. Classification of chemical reactions. Gas state. Properties of gases, equation of state and laws of ideal gases, real gases. Properties of gas mixtures. Gas diffusion. Liquefaction. Critical point. Liquid state. Properties of liquids. Vapor tension and evaporation. Humidity. Solutions. Nature of solutions. Solubility and saturated solutions. Concentration. Gas solubilization in liquids. Vapor pressure of ideal solutions. Azeotropes. Colligative properties. Heterogeneous mixtures, colloidal dispersions. Chemical kinetics. Reaction rate. Kinetic equations, reaction mechanisms. Arrhenius' equation. Catalysts. Thermochemistry. State functions, heat, and work. Laws of thermodynamics. Spontaneous and reversible reactions. Criteria of spontaneity. Chemical equilibrium: Nature and thermodynamic basis. Equilibrium constants, law of mass action. Le Chatelier principle. Equilibria in solution. Heterogeneous equilibria. Solubility equilibrium. Acid-base equilibrium, polyprotic acids and bases, amphoterism, pH, acidic and basic hydrolysis, buffer solutions. Electrochemistry. Electrolysis and electrolytical cells. Galvanic cells, Daniell cell. Standard electrode and cell potentials. Electrochemical series of elements. Nernst equation.
Books and bibliography	A. M. Manotti Lanfredi, A. Tiripicchio, Fondamenti di Chimica, 2° ed. (Casa Editrice Ambrosiana, 2006)
Additional materials	Slides and further material provided by the teacher

Work schedule			
Total	Lectures	Hands on (Laboratory, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
Hours			
150	*48*	*-*	*102*
ECTS			
6	*6*		

Teaching strategy	
	The class consists of lectures with the support of slides and other multimedia content. For each topic the teacher gives practical examples of technological interest or helping to contextualize the contents in the everyday reality.
Expected learning outcomes	
Knowledge and understanding on:	○ Understanding the foundations of the scientific method and the main characteristics of an experimental measure. ○ Appreciate the basis of inductive and deductive thinking. ○ Learning the theoretical reference models and a comprehensive knowledge of modern chemistry. ○ Being able to represent a chemical reaction both in qualitative and quantitative terms.
Applying knowledge and understanding on:	○ Acquiring the ability to think in order to translate observable phenomena into chemical reactions and processes.
Soft skills	• *Making informed judgments and choices* ○ Developing critical thinking. ○ Acquiring the ability to describe a physico-chemical system both qualitatively and quantitatively and to make hypotheses on how to perturb the system on purpose. ○ Developing the skill to critically comment experimental data. • *Communicating knowledge and understanding* ○ Acquire the scientific lexicon, and in particular chemical glossary. ○ Developing the ability to report scientific content in a meticolous and thorough way, as well as to express an experimental measure properly. • *Capacities to continue learning* ○ Developing the ability to identify the key-concepts in every topic and to find links between them. ○ Developing chemical intuition, i.e., the ability to translate everyday phenomena in the physico-chemical language.

Assessment and feedback	
Methods of assessment	The evaluation is performed through an oral exam about the class contents. If the number of attending students forbids a proper evaluation through oral exams, they will be replaced with written tests.
Evaluation criteria	• *Knowledge and understanding* ○ The candidates must have acquired the foundations of the scientific method and of the main characteristics of an experimental measure, the reference theoretical models for describing the nature of matter, bonds, and chemical processes. • *Applying knowledge and understanding* ○ The candidates must be able to express a chemical quantity with the proper units and to apply the contents of the course in practical cases proposed by the teacher. • *Autonomy of judgment* ○ The candidates must be able to describe a physico-chemical system both qualitatively and quantitatively, to postulate hypotheses on how to perturb it on purpose, to interpret critically experimental data. • *Communicating knowledge and understanding* ○ The candidates must have developed the ability to recognize the key concept of each topic and to link them properly. ○ They must be able to interpret daily phenomena based on the knowledge and the methods learned throughout the course.

	• *Communication skills*
	  ○ The candidate must know how to express with a glossary proper for the scientific context, to elaborate in a rigorous way on the topics subject of the class, to report scientific content in a meticulous and thorough way, as well as to express an experimental measure properly.
	• *Capacities to continue learning*
	  ○ The candidate must have developed the ability to identify the key-concepts in every topic, to find links between them, and must have strengthen their chemical intuition, i.e., the ability to translate everyday phenomena in the physico-chemical language according to the concepts and techniques absorbed throughout the lessons.

Criteria for assessment and attribution of the final mark	The final evaluation will consider all the criteria exposed. The score of the final oral exam will be given in thirtieths. If the exam will be performed through written tests, they will consist in a set of multiple-choice or open questions.
Additional information	