Stampare su carta intestata del CdS

General information	
Academic subject	**General and Inorganic Chemistry**
Degree course	Science and Technical Nautical Management
Academic Year	1st year (2021-2022)
European Credit Transfer and Accumulation System (ECTS)	7
Language	Italian
Academic calendar (starting and ending date)	1st semester (October 11, 2021 – January 29, 2022)
Attendance	Discretionary

Professor/ Lecturer	
Name and Surname	Leonardo Triggiani
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Telephone	
Department and address	
Virtual headquarters	Teams code: d2elknq
Tutoring (time and day)	All Tuesdays and Fridays, from 3 to 5 PM Students should previously get in touch with the teacher via e-mail.

Syllabus	
Learning Objectives	The class contributes to the transmission of methods and contents typical of chemical disciplines, both theoretical/general, and more specific and applied to several technological fields.
Course prerequisites	There are no specific prerequisites, aside from basic math knowledge.
Contents	Introduction. Main definitions, experimental measures, units of measure. Atomic theory of matter: fundamental laws of Chemistry, atoms, isotopes, atomic and molecular weights, moles, Avogadro number. Electronic structure of atoms: atomic models, elements of quantum mechanics, atomic orbitals, quantum numbers, contour surfaces, orbital filling order, electronic configuration, periodic table of the elements, periodic properties. Chemical bond: ionic bond, covalent bond, metallic bond, and band theory; weak bonds. Nomenclature of inorganic compounds: oxidation number, IUPAC rules and traditional nomenclature of the main classes of inorganic compounds. Chemical reactions, balance, and stoichiometry: chemical equations and reactions, balancing acid-base, exchange, and reduction-oxidation reactions, ponderal calculations, limiting reagent, reaction yield. Gas state: properties of gases, equation of state and laws of ideal gases, real gases, gas diffusion, liquefaction, critical point, properties of gas mixtures. Liquid state: properties, surface tension and capillarity, vapor tension, phase transitions, state diagrams. Solid state: general properties, types of solids. Solutions: nature of solutions, electrolytic solutions, solubility and saturated solutions, concentration, gas solubilization, Henry and Raoult laws; colligative properties. Chemical kinetics: reaction rate, kinetic equations, reaction order, reaction mechanisms, Arrhenius' equation, transition state theory, catalysts. Thermochemistry: state functions, heat and work, laws of thermodynamics,

	enthalpy and entropy, spontaneous reactions. Chemical equilibrium: reaction quotients and equilibrium constants, Le Chatelier principle, solubility equilibrium; acid-base equilibrium. Acids and bases: historical and modern definitions, strength of acids and bases, polyprotic acids and bases, amphoterism, scale of acidity, acidic and basic hydrolysis, buffer solutions; pH evaluation, pH indicators; titration. Electrochemistry: electrolysis and electrolytical cells, Faraday's laws, galvanic cells, batteries, electrode and cell standard 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 other materials distributed by the teacher

Work schedule			
Total	Lectures	Hands on (Laboratory, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
Hours			
175	*56*	-	*119*
ECTS			
7	*7*		

Teaching strategy	
	The class is made of frontal lessons 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. Solving exercises on selected topics allows students to also think quantitatively, other than theoretically or qualitatively.
Expected learning outcomes	
Knowledge and understanding on:	Understanding the foundations of the scientific method and the main characteristics of an experimental measure. Learning the theoretical reference models and a comprehensive knowledge of modern chemistry.
Applying knowledge and understanding on:	Acquiring fundamental chemical knowledge, which can be directly applied in several fields (e.g. biological, environmental, technological, health).
Soft skills	• *Making informed judgments and choices* 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 process comprises 2 intermediate tests on theory, and a final written exam with multiple-choice questions and problems.*
Evaluation criteria	• *Knowledge and understanding* The evaluation process consists of intermediate tests of theoretical content (not mandatory), based on multiple-choice questions, and a final written test based on both multiple-choice questions and exercises. • *Applying knowledge and understanding* The candidate must have acquired the foundations of the scientific method and the main features of an experimental measure, the theoretical reference models to describe the structure of matter, bonds, and chemical transformations. • *Autonomy of judgment* The candidate must be able to express a chemical quantity with the proper units, to convert data in similar units and to perform calculations for solving chemical problems (e.g. pH evaluation, heterogeneous equilibria, stoichiometry). • *Communicating knowledge and understanding* The candidate must be able to describe a physico-chemical system both qualitatively and quantitatively, to postulate hypotheses on how to perturbi t on purpose, to interpret critically experimental data for solving a chemical problem. • *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	- 2 intermediate tests (***I1***, ***I2***), to be held at around 1/3 (*I1*) and 2/3 (*I2*) of the overall duration of the class. Each test consists of multiple-choice questions, mostly focused on theory. - 1 written exam, made of 4 parts: • ***T1*** and ***T2***: similar to *I1* and *I2,* are only for candidates who failed or opted out of the intermediate tests; • ***T3***: still similar to the previous tests (multiple-choice questions), is for all candidates; • ***P4***, includes exercises of the same type of those presented during the lessons, and is for all candidates.

	The "theoretical score" (***VTE***) is the average of the results of *T1* (or *I1*), *T2* (or *I2*), and *T3*, expressed in thirtieths. The "exercise score" (***VEX***) is the result of *P4*, expressed in thirtieths. The exam is passed if both scores are equal or higher than 18/30. The final score is the weighted average of *VTE* and *VEX*, the former having a weight of 2/3, the latter of 1/3.
Additional information	