Stampare su carta intestata del CdS

General information		
Academic subject	**Chimica**	
Degree course	BD Physics	
Academic Year	2021/2022	
European Credit Transfer and Accumulation System (ECTS)		Chemistry
Language	Italian	
Academic calendar (starting and ending date)	October-December 2021	
Attendance	Compulsory	

Professor/ Lecturer	
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Department and address	Chemistry
Virtual headquarters	Savino Longo on MS Teams
Tutoring (time and day)	Tuesday-Thursday from 11 to 13 and from 16 to 17, in person or online, by appointment.

Syllabus	
Learning Objectives	To teach the conceptual bases and methods of solving exercises in general chemistry, with particular attention to the needs of the physics student
Course prerequisites	Basic Physics, Electrostatics, Thermodynamics, Calculus 001
Contents	The exam is based on the application of concepts and not so much on theoretical concepts. It is advisable to carefully carry out the examples in the text and the exercises at the end of the chapter, not all of them, but those that are relevant to the paragraphs marked. From the reference text (available online, see note below) chap. 1: 1.1, 1.2, 1.3, 1.4, 1.5, 1.7 (only the first two pages), chapter 2: everything except 2.7 chap. 3: 3.1, 3.2, 3.3, 3.4, 3.5 chapter 4: everything chapter 5: everything except 5.9 chap. 8: 8.1, 8.3, 8.7, 8.8, for all without the equations chap.9: everything, except: the explanation of fig.9.1, the formulas of 9.3 chap. 10: 10.1, 10.2, 10.3 chapter 11: everything except 11.2 and the “exceptions to the rules” at the end of 11.3 chapter 12: only 12.1 chap. 15: 15.4, 15.5 (except in the case of benzene) chap. 16: 16.5, 16.6 (without proofs) chap. 17: 17.1 chap. 18: 18.1 (not Trouton), 18.2, 18.4 (not the phase rule), 18.5, 18.6 chap. 19. 19.2, 19.3, 19.4, 19.5 Abilities: Give an appropriate name to an inorganic compound from its formula, write the

	formula corresponding to the name. Know the simplest organic compounds. Know the most important strong and weak acids. Balance the reactions. Balance redox reactions in ionic form (in cases where only two elements change their oxidation numbers) Determine masses in grams of reactants and products, volumes of necessary solutions and any gases produced, knowing the atomic weights. Connect the heat absorbed or released to the masses or moles of reagents consumed knowing the enthalpies of formation of the substances involved or the appropriate binding energies. For gases and gas mixtures connect composition, density, masses in grams, pressure, volume and temperature. For solutions: connect molar concentrations, masses in grams and volumes. Solve mixing problems. For a chemical equilibrium, apply the law of mass action and write the equilibrium constant. Discuss the effect of changes in volume, pressure, temperature, addition of solvent, addition of reagents or products, using the Le Chatelier principle. Write the electronic configuration of an atom or atomic ion, knowing the atomic number of the element. For lighter elements, know the corresponding group. Discuss the shape of the atomic s, p, and hybrid orbitals. Write Lewis structures of compounds, determine suitable hybrid orbitals, highlight possible resonances and discuss relative bond lengths. Discuss the isomers of a substituted hydrocarbon accounting double bonds. Allocate the oxidation numbers to atoms in compounds using algebraic rules and Lewis structures. Use the repulsion method (VSEPR) to determine the spatial arrangement of atoms in molecules. Determine the solubility in terms of moles or grams per liter of poorly soluble compounds in water from the constant Kps, also taking into account any common ion effects. Calculate the pH of solutions of strong and weak acids, strong and weak bases, salts, buffer solutions. Calculate colligative quantities of solutions, from colligative quantities determine concentrations and quantities in grams of solutes Determine the EMF of a battery with standard potentials and with the use of the Nernst equation. From standard EMF's determine the spontaneity of reactions or the concentration of species (e.g. pH).
Books and bibliography	Dickerson, Richard E. and Gray, Harry B. and Haight, Gilbert P.: Chemical principles. The text is available for free in pdf format, chapter by chapter, on the Caltech authors website: https://authors.library.caltech.edu/25050/. An Italian translation

	is available in the Chemistry library if needed.
Additional materials	

Work schedule			
Total	Lectures	Hands on (Laboratory, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
Hours			
150	32	30	88
ECTS			
6			

Teaching strategy	Traditional teaching with the use of the blackboard and direct involvement of the students in the realization of drawings of structures, into the discussion of the principles and the resolution of the exercises.
Expected learning outcomes	
Knowledge and understanding on:	○ Basic principles of chemistry ○ Ability to understand the fundamental concepts of chemistry between those of chemistry, albeit inspired by ideas of physics and those deriving directly from physical principles ○ Application of chemistry methods, when relevant, to systems and apparatuses of physical interest.
Applying knowledge and understanding on:	○ See the contents
Soft skills	• Making informed judgments and choices ○ Knowing how to apply the correct principles according to the problem ○ Understanding the limits of approximations and techniques • Capacities to continue learning ○ The understanding of principles of basic chemistry allows to pursue further studies in several fieds.

Assessment and feedback	
Methods of assessment	Oral exam based mainly on exercises.
Evaluation criteria	• Knowledge and understanding ○ Understanding of the principles, and their contexts of application • Autonomy of judgment ○ Appropriate choice of solution method ○ Appropriate detection of relevant principles • Communication skills ○ Knowing how to explain the technique used, ○ Knowing how to graphically represent structures and concepts • Capacities to continue learning ○ Capacity to use the principles in future studies
Criteria for assessment and attribution of the final mark	Above all, the ability to solve problems with the identification of the best solution strategy is evaluated, secondly, the language property in the discussion of the theoretical principles related to the proposed exercises.
Additional information	