

COURSE OF STUDY PHARMACY
ACADEMIC YEAR 2024-2025
ACADEMIC SUBJECT GENERAL AND INORGANIC CHEMISTRY

General information	
Year of the course	I
Academic calendar (starting and ending date)	October 2024 February 2025
Credits (CFU/ETCS):	9
SSD	CHIM/03
Language	Italian
Mode of attendance	60% of lectures and seminars hours.

Professor/ Lecturer	
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Department and address	Catholic University Our Lady of Good Counsel
Virtual room	Google Classroom: Codice 6t43y20
Office Hours (and modalities: e.g., by appointment, on line, etc.)	By appointment via e-mail

Work schedule			
Hours			
Total	Lectures	Hands-on (laboratory, workshops, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
225	56	30	139
CFU/ETCS			
9	7	2	

Learning Objectives	In this course, Pharmacy students will learn the basics of chemistry, in order to have consolidated knowledge, to understand and further interpret inorganic chemical transformations from a structural, thermodynamic, kinetic and electrochemical point of view. They will need this knowledge both in the following courses during their university years and in the practical application of their profession. Also, some drugs are inorganic compounds and during this course students will learn the properties and behavior of inorganic compounds.
Course prerequisites	Preliminary knowledge is not required since it is a first-year course

Teaching strategies	Theoretical frontal lessons supported using of power point. Classroom exercises: Interactive exercises in general and inorganic chemistry.
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Expected learning outcomes in terms of	
Knowledge and understanding on:	<p>At the end of the course the student:</p> <ul style="list-style-type: none"> ○ must be able to know and explain inorganic chemical structures, to analyze and interpret inorganic chemical transformations,
Applying knowledge and understanding on:	<p>At the end of the course the student:</p> <ul style="list-style-type: none"> ○ must be able to apply chemical knowledge to solve stoichiometric, thermochemical, kinetic problems, those of molecular structure, chemical equilibrium, colligative properties of solutions, reactions between ions in solution, including redox reactions, to calculate the pH, the solubility, the e.m.f. of the batteries, the electrolysis products.
Soft skills	<p>At the end of the course the student:</p> <p>○ must demonstrate and chemically interpret different problems of everyday life and above all in the pharmaceutical field, that have to do with chemical transformations.</p>
Syllabus	
Content knowledge	<p>The atomic theory. Law of the conservation of mass (Lavoisier). Law of the defined proportions (Proust). Law of multiple proportions (Dalton). Gay-Lussac's Law. Avogadro's Principle. Rule of Cannizzaro. Atomic and molecular weight, equivalent weight and mol. (Mortimer I p.38-85) (Silvestroni p.129-130, p.190-191)</p> <p>Atomic structure. The discovery of the electron, proton and neutron, their characteristics. Atomic number, mass number. Isotopes. Electromagnetic radiation. Atomic spectra. Bohr's model. Wave-particle dualism. Uncertainty principle. Wave Theory. Schrödinger equation. Quantum numbers. Orbitals. Exclusion principle of Pauli. Hund's Rule. (Mortimer I p.123-191) (Silvestroni p. 1-25)</p> <p>The Periodic Structure and construction of the periodic system. Potential ionization. Electron affinity. Metals, non-metals, semimetals. Some preliminary rules for chemical nomenclature. Chemical bonds. Ionic bond. Covalent bond. Valence Bond Theory. Electronegativity. Polar bonds. Hybridization. Resonance. The polarity of the molecules. (Mortimer I p.192-296) (Silvestroni p. 25-29, p. 34-66)</p> <p>The chemical reactions balancing on the basis of the conservation of mass. Oxidation and reduction. Oxidation number. Balancing of redox reactions with the method of the variation of the oxidation number. Equivalent weight for oxidizing and reducing substances. (Mortimer I p.451-496) (Silvestroni p. 73-81)</p> <p>The nucleus. Energy characteristics of the core. Stability and nuclear instability. Radioactivity. Fission energy and fusion. (Mortimer II p.247-279) (Silvestroni p. 505-520)</p> <p>Thermodynamics. The driving force of chemical reactions overview on the principles of thermodynamics: their importance in chemistry. Criteria of spontaneity. Hess's Law and thermochemistry. (Mortimer I p.86-122, p.671-705) (Silvestroni p. 83-112)</p> <p>Gases: general properties. The gas laws. Boyle's Law. The laws of Charles</p>

	<p>and Guy-Lussac. General gas state equation. Partial pressures. The law of Graham. The kinetic theory: a model for ideal gases. Distribution of Maxwell-Boltzmann. Real gases. The equation of Van der Waals. The liquefaction of the gas. (Mortimer I p.297-354) (Silvestroni p. 116-147)</p> <p>Solids and liquids. The solids and their geometric structure. The solids and bonds. Liquids. Evaporation. Vapor pressure. Clausius Clapeyron law. State changes. Diagram of state of water. (Mortimer I p.355-404) (Silvestroni p. 149-167)</p> <p>Ways of expressing concentration. The formation of the solutions. The vapor pressure of the solutions. The colligative properties. The law of Raoult. Osmosis. The colligative properties and electrolytes. (Mortimer I p.406-450) (Silvestroni p. 185-222)</p> <p>Chemical kinetics. The reaction rate. Order and molecularity. Reaction mechanisms. The rate and temperature. Catalysis. (Mortimer I p.497-540) (Silvestroni p. 293-317)</p> <p>Chemical equilibrium: generalities. The law of mass action. The equilibrium constant. Various ways of expressing the equilibrium constant. Factors affecting the chemical equilibrium. The equilibrium constant and temperature. The heterogeneous equilibria. Mobile Principle of equilibrium (Le Chatelier). (Mortimer I p.541-563) (Silvestroni p. 252-269)</p> <p>Ionic equilibria. The acid-base equilibria: generalities. Self-ionization of water. The pH of solutions of strong acids and bases. The pH of solutions of weak acids and bases. The degree of dissociation and pH. Law of dilution. The ions such as acids and bases. The buffer solutions. Acid-base titrations. (Mortimer I p.589-643) (Silvestroni p. 349-402)</p> <p>The solubility equilibrium. Solubility, product constants. Common-ionic effect. (Mortimer I p.644-670) (Silvestroni p. 403-408)</p> <p>Electrochemistry: general. The batteries: construction and operation: normal reduction potentials. The Nernst law. The concentration cell. The electrochemistry and thermodynamics. Batteries of practical use. Electrolysis. Order of discharge. Examples of electrolysis. Quantitative aspects of electrolysis. Faraday's laws. Practical uses of electrochemistry: corrosion, refining, galvano-plastic electroplating. (Mortimer I p.707-767) (Silvestroni p. 410-453, 456-488)</p> <p>Inorganic chemistry. Some general rules of nomenclature. Hydrides and their properties. The oxides and their properties. Formulas and IUPAC names of binary and ternary compounds formed by the elements of the groups A. Alkali metals, alkaline earth metals, elements of III A group, elements of IV A group, nitrogen compounds, oxygen, sulfur, halogens, transition metals. (Mortimer II p.3-23, p.37-47, p.74-99, p.172-197) (Silvestroni p. 564-579, p.588-654).</p>
Texts and readings	<p>obligatory bibliography: CHIMICA (II Edizione) Ch. Mortimer, in albanian language Editrice SHBLU CHIMICA (II Edizione) I. Bertini, C. Luchinat F. Mani Casa Editrice Ambrosiana</p> <p>a) recommended bibliography: FONDAMENTI DI CHIMICA P. Silvestroni (6 edizione) Libreria Eredi Virgilio</p>

	<p>Veschi CHIMICA un approccio molecolare (Edizione: I/2012) Nivaldo J.Tro Casa Editrice: EdiSES CIMICA DI BASE G. Bandoli A. Dolmella G. Natile Casa Editrice: EdiSES ELEMENTI DI STECHIOMETRIA P. Giannoccaro, S. Doronzo Casa Editrice: EdiSES STECHIOMETRIA I. Bertini, F. Mani Casa Editrice Ambrosiana</p>
Notes, additional materials	Possibility of integrating the consultation of the texts with the teaching material made available by the teacher.
Repository	The teaching material will be made available to the student on a dedicated teams channel.

Assessment	
Assessment methods	Periodic and final check: 35% from the level of participation in seminars and 65% from the final exam (written and oral exam).
Assessment criteria	<ul style="list-style-type: none"> • Knowledge and understanding <ul style="list-style-type: none"> ○ appropriateness, correctness, and congruence of knowledge aquired during the course • Applying knowledge and understanding <ul style="list-style-type: none"> ○ Illustrating methodological interconnections between the various topics of the course • Autonomy of judgment <ul style="list-style-type: none"> ○ The student must be able to rationally interpret and illustrate case studies in the development of drugs • Communicating knowledge and understanding <ul style="list-style-type: none"> ○ Expressive capacity ○ Appropriate use of the specific language of the discipline ○ Logical skills and consequentality in the connection of contents • Communication skills <ul style="list-style-type: none"> ○ Ability to connect different topics by finding common points and to establish a coherent general design, taking care of the structure, organization, and logical connections of the expository discourse ○ Ability to synthesize also through the use of the symbolism of the material and the graphic expression of notions and concepts, for example in the form of formulas, schemes, equations. • Capacities to continue learning <ul style="list-style-type: none"> ○ Development of the necessary learning capacities for practical application of knowledge and skills acquired during the course
Final exam and grading criteria	<p>The final grade is awarded out of thirty. The exam is passed when the grade is greater than or equal to 18. The grade is determined by an overall evaluation concerning the clarity of the presentation, the completeness of the acquired knowledge, the property of the specific vocabulary of the subject, the depth of knowledge, and the ability to analyze questions and provide suitable answers. In particular, the grade breakdown is as follows:</p>

	<p>Insufficient: 0-17 Lack of, incomplete, and inadequate knowledge of the topics contained in the syllabus, use of non-technical vocabulary</p> <p>Sufficient: 18-20 Sufficient knowledge of the topics contained in the syllabus and overall adequacy of the technical vocabulary used</p> <p>Adequate: 21-23 Adequate knowledge of the topics contained in the syllabus, adequate ability to argue and make connections between the various topics, use of appropriate technical vocabulary</p> <p>Good: 24-26 Good knowledge of the topics contained in the syllabus, good capacity for in-depth analysis and criticism through the use of an adequate technical vocabulary</p> <p>Distinguished: 27-28 More than good knowledge of the topics contained in the syllabus, more than good capacity for in-depth study, for linking the various topics, for critique and mastery of technical vocabulary</p> <p>Excellent: 29-30 Excellent knowledge of the topics contained in the syllabus, excellent ability to deepen and link between the different topics, as well as criticism and mastery of the technical vocabulary</p> <p>Excellent: 30L Excellent knowledge of the topics contained in the syllabus, outstanding capacity for in-depth study, for linking the various topics, for critique and mastery of the technical vocabulary</p>
Further information	