MODELLO SCHEDA INSEGNAMENTO

Corso di Laurea	**Scienze Biologiche**
Denominazione insegnamento:	**General and Inorganic Chemistry**
Numero di Crediti:	**8**
Anno	**first**
Semestre:	**first semester**
Docente Titolare:	**Daniela Pappalardo**
Dottorandi/assegnisti di ricerca che svolgono attività didattica a supporto del corso:	
Orario di ricevimento:	**Thursday 11-13, after appointment by email (pappalardo@unisannio.it)**
Indirizzo:	**via dei Mulini 59/A, Benevento**

PRESENTAZIONE DEL CORSO:

The General and Inorganic Chemistry course is a fundamental one in the degree course in Biological Sciences. The course is aimed at acquiring and consolidating the basic knowledge of chemistry for understanding the structure of matter in terms of atoms and molecules and chemical phenomena.

GLI OBIETTIVI FORMATIVI

At the end of the course the student will have to know the main laws of General Chemistry, the atomic structure and periodic properties of the elements, the main classes of inorganic compounds and their properties, the chemical-structural characteristics of matter in the various aggregation states, chemical reactions, acid-base reactions, principles of thermodynamics and kinetics of reactions and chemical equilibrium, stoichiometric calculation, and be able to use of an appropriate scientific language.

At the end of the course students should be able to:

- Describe the atomic structure
- Describe the electronic configuration of atoms and their periodic properties

• Understand and describe the different types of chemical bonds and the geometric properties of molecules

• Know the Lewis notation, the VSEPR theory, the of valence bond theory, the molecular orbitals

• Apply the general laws of General Chemistry and stoichiometric calculation for solving simple problems

• Determine the empirical formula by the weight percentage composition

• Classify chemical reactions, balance chemical reactions and calculate reaction products. Define the defective reagent and yield a reaction

• Describe the elements and classify them in periods and groups

• Describe intermolecular forces

• Describe the properties of gases. Describe the equations of ideal gas and real gas

• Describe the properties of solids. Describe the crystalline lattice and amorphous

• Describe the properties of liquids. Describe the surface tension

• Know the status diagrams for system with one component

• Match the chemical structure of materials to their properties

• Know and use solution concentration units: molarity; normal; molar fraction; molalità; percentages

• Describe the nature and characteristics of the state of equilibrium. Apply the principle of Le Chatelier to predict the effect of a perturbation, the expression of the equilibrium constant and numerical methods for calculating concentrations at equilibrium

• Describe the solubilization phenomena. Describe the precipitation reactions and the expression of the solubility product. Describe colligative properties and their laws

• Know the different definitions of acids and bases: Arrhenius; Brønsted and Lowry; Lewis.

• To know the water's auto-ionization and its role in acid-base reactions

• Determine the pH of solutions of strong acid and strong bases

• Determine the pH of solutions of weak acid and weak bases

• Describe the characteristics of buffer solutions and their preparation. Calculate the pH of buffer solutions

• Describe the phenomenon of salt hydrolysis

• Know and describe the energetic and kinetic aspects of chemical transformations

• Describe and balance ox-red reactions

• Describe the operation of the voltage cells

• Know the use of potential standards and general aspects of Nernst's law

PREREQUISITI RICHIESTI

Basic knowledge of math, physics and chemistry at high school level

FREQUENZA DELLE LEZIONI

The frequency of lessons is highly recommended. Lessons will be supported by numerical exercises and examples useful for understanding the theoretical contents. Numerous stoichiometric exercises and simulations of the final exam will be scheduled during the lessons.

CONTENUTI DEL CORSO

Chemical and physical properties. Basic chemistry. Atomic masses and isotopes. Chemical formulas. Nomenclature. Chemical reaction classes. Balancing chemical reactions. Atomic structure. Atomic models. Electronic configurations. The Periodic Table. Periodic properties of elements. The bond (ionic, covalent, semipolar, dative, metallic, hydrogen, Van der Waals forces). Lewis Structure. Molecular Geometry.

The aggregation states of matter. Gaseous state. Solid State. Liquid state and solutions. Elements of chemical kinetics. Thermodynamic elements. Balance in chemical reactions. Balances in gas phase, heterogeneous and in solution. Calculation of balance concentrations. Acids and bases. Water and pH self-proteins. Buffer solutions. Hydrolysis reactions. Solubility Balances. Elements of electrochemistry.

METODI DIDATTICI

Lectures with the aid of audio-visual presentations and numerical exercises

TESTI DI RIFERIMENTO

- Chang; Fondamenti di Chimica Generale; The McGraw-Hill Companies
- Lanfredi, Tiripicchio; Fondamenti di Chimica; Ed. Ambrosiana.
- Corradini; Chimica Generale; Ed. Ambrosiana
- Kotz, Treichel, Townsend – **Chimica** – Edises
- P. M. Lausarot; G.A. Vaglio. Calcoli Stechiometrici. Piccin Editore
- I. Bertini, C. Luchiat, F. Mani. Stechiometria: un avvio allo studio della chimica. Casa Editrice Ambrosiana.

ESAME DI PROFITTO

Written test and oral interview, which can be accessed after passing the written test. The final vote, is an average of two ratings.

The written test involves carrying out stoichiometry exercises (No. 4) and open question (No 2) for two hours. The written test will evaluate the ability to solve numerical problems related to stoichiometric calculation and knowledge of course contents. The written test will be evaluated as follows:

• 5 points for each correct answer;

• 0 points for each null, wrong or wrong answer.

The written test is overcome with an evaluation of 18/30.

The oral interview will be aimed at ensuring the knowledge of the contents of the course, as indicated by the program. The quality of the content, the relevance of the answers to the questions asked, the ability to relate to other subjects covered by the program, the ability to give examples, and the use of technical language will contribute to the evaluation.

CALENDARIO ESAMI

See link

PRENOTAZIONE ESAMI

See link

https://servizistudenti.unisannio.it/pls/self/gissweb.home

SYLLABUS

Argomenti	Ore	Tipologia di lezione	Riferimenti bibliografici consigliati
Materials, elements, mixtures, compounds. Chemical and physical properties. Basic Chemistry, Avogadro's hypothesis. Atomic masses and isotopes. Concept of mole and molar mass.	4	Lesson and class exercices	For the theory lesson: - Lanfredi, Tiripicchio; **Fondamenti di Chimica**; Ed. Ambrosiana. - Corradini; **Chimica Generale**; Ed. Ambrosiana - Kotz, Treichel, Townsend – **Chimica** – Edises - Chang; **Fondamenti di Chimica Generale**; The McGraw-Hill Companies For the class exercices: - P. M. Lausarot; G.A.
Chemical formulas. Ionic and molecular compounds. Nomenclature of inorganic compounds	2	Lesson	
Atomic structure. Experiments by Thomson, Millikan, Rutherford. The Bohr model of the atom. Atomic orbits, quantum numbers, and electronic spin.	6	Lesson	
Electronic configurations: the principle of Aufbau. The Periodic Table. Periodic properties of elements: atomic rays, ionization potentials, electronic affinities, electronegativity.	8	Lesson	
Ionic bonds. Ionic compounds and their properties.	2	Lesson	
The covalent bond theory. Lewis Structure. Molecular Geometry. VSEPR theory and the hybridization concept. Polar	6	Lesson and class exercices	

molecules. Molecular orbital theory			Vaglio**. Calcoli Stechiometrici**. Piccin Editore - I. Bertini, C. Luchinat, F. Mani. **Stechiometria: un avvio allo studio della chimica**. Casa Editrice Ambrosiana.
Chemical reactions and balance. Stoichiometry of reactions.	2	Lesson and class exercices	
Intermolecular forces.	2	Lesson	
Gaseous state. Gas properties and laws. The ideal gas equation. The law of Dalton. Real gas. Notes to the kinetic theory of gases.	4	Lesson and class exercices	
Solid State. Types of solids (amorphous, crystalline, molecular, covalent, ionic, metallic and relative properties).	2	Lesson	
Liquid state and solutions. Vapor pressure. Solutions. Molarity, molarity and molar fraction. Raoult and Henry's Laws. Solubility. Colligative properties.	8	Lesson and class exercices	
Thermodynamic elements. Hess's law. I and II the principle of thermodynamic. Gibbs energy	2	Lesson	
Equilibrium in chemical reactions. Calculation of concentrations at equilibrium	4	Lesson and class exercices	
Definitions of acids and bases. Acid-base reactions. Buffer solutions. Hydrolysis reactions. Solubility equilibria	8	Lesson and class exercices	
Electrochemistry. Faraday Electrolysis and laws. Galvanic cells. Electrochemical Series. Nerst's equation	2	Lesson	
Chemical kinetics. Reactions rate, reaction order and mechanism. Arrhenius equation. Theory of the activated complex.	2	Lesson	