



# UNIVERSITÀ DEGLI STUDI DI PALERMO

<b>DEPARTMENT</b>	Ingegneria
<b>ACADEMIC YEAR</b>	2020/2021
<b>BACHELOR'S DEGREE (BSC)</b>	BIOMEDICAL ENGINEERING
<b>SUBJECT</b>	CHEMISTRY
<b>TYPE OF EDUCATIONAL ACTIVITY</b>	A
<b>AMBIT</b>	50293-Fisica e chimica
<b>CODE</b>	01788
<b>SCIENTIFIC SECTOR(S)</b>	CHIM/07
<b>HEAD PROFESSOR(S)</b>	PALMISANO LEONARDO Cultore della Materia Univ. di PALERMO
<b>OTHER PROFESSOR(S)</b>	
<b>CREDITS</b>	9
<b>INDIVIDUAL STUDY (Hrs)</b>	144
<b>COURSE ACTIVITY (Hrs)</b>	81
<b>PROPAEDEUTICAL SUBJECTS</b>	
<b>MUTUALIZATION</b>	
<b>YEAR</b>	1
<b>TERM (SEMESTER)</b>	1° semester
<b>ATTENDANCE</b>	Not mandatory
<b>EVALUATION</b>	Out of 30
<b>TEACHER OFFICE HOURS</b>	<b>PALMISANO LEONARDO</b> Tuesday 10:30 12:30 Ufficio Prof. Leonardo Palmisano 2° piano Edificio 6, Viale delle Scienze. Thursday 10:30 12:30 Ufficio Prof. Leonardo Palmisano 2° piano Edificio 6, Viale delle Scienze.

<p><b>PREREQUISITES</b></p>	<p>To address the study of Chemistry, knowledges of basic mathematics are required (calculation of percentages, solution of quadratic and logarithmic equations).</p>
<p><b>LEARNING OUTCOMES</b></p>	<p><b>LEARNING OUTCOMES</b></p> <p>Knowledge and understanding</p> <ul style="list-style-type: none"> <li>•At the end of the course, the student will acquire the basic knowledge of the structure of matter, the principles governing its chemical-physical transformations and the energy variations that accompany it. In particular, will have acquired the basic knowledge about: atoms and atomic structure; Chemical bond theory; Phase equilibria; Aggregation states; Chemical equilibria; Thermodynamic Functions; Electrochemistry; Nomenclature of organic and inorganic compounds; Material properties (melting and boiling temperature, vapor pressure, heat conductivity and current).</li> </ul> <p>Applying knowledge and understanding</p> <ul style="list-style-type: none"> <li>•Logical reasoning ability and aptitude to tackle problems scientifically rigorously.</li> <li>•Ability to correlate the structure of matter with its properties (melting and boiling temperature, vapor pressure, conductivity).</li> <li>•Capacity in solving problems regarding combustion, molecular, ionic and acid-base equilibrium.</li> <li>•Ability to understand the transformations of the matter according to chemical reactions.</li> </ul> <p>Making judgements</p> <ul style="list-style-type: none"> <li>•The student will have gained autonomy in the application of the basic concepts of Chemistry and in the resolution of problems regarding the combustion, molecular, ionic and acid-base equilibria, electrochemical cells and electrolytic phenomena.</li> </ul> <p>Communication skills</p> <ul style="list-style-type: none"> <li>•The student will be able to communicate with competence and properties of language about the problems relating to the matter structure and its transformations in order to better understand the behavior of the materials.</li> </ul> <p>Learning skills</p> <ul style="list-style-type: none"> <li>• The student will be able to deal independently the study of problems concerning all aspects presented during the course.</li> </ul>
<p><b>ASSESSMENT METHODS</b></p>	<p>Learning of the contents presented during the course will be evaluated using two tests: one written and one oral. An on-going test will also be carried out on the subjects covered during the first part of the course and of the same type of examination test, to help the student to afford the final examination and make him aware of the degree of preparation he has achieved. The on-going test will not weigh on the final evaluation.</p> <p>The written examination, which tends to verify the skills and the knowledge relating to the disciplinary scope of the course, will be composed of ten clear questions and uniquely interpretable, numerical and theoretical, with open answers that meet constraints that make them comparable with the predetermined correction criteria. It will be considered the logic followed by the student in the resolution of the questions; the correctness of the procedure identified for the solution of the question; the accuracy of the final result; the adequacy of the numerical found result; the ability to understand the results obtained; the use of an adequate language. Numerical questions presented in the written examination will cover the following topics: stoichiometry, ideal gas laws, colligative properties of solutions, Hess law, molecular equilibria, ionic equilibria (pH of aqueous solutions, solubility), balancing oxidation reactions, calculation of the electromotive force of a stack, Faraday's laws. Theoretical questions will address less applicable topics such as atomic theories (quality), acid-base theories, the description of the ideal gas model, the description of the parameters that affect a chemical balance, the fundamental laws of chemistry and organic chemistry. The total score of the written tests will be out of thirty and will result from the sum of the scores given to each question depending on its complete resolution, partial or no resolution. The expected duration of the written examination is two hours and achieving a score of at least 15/30 is a necessary condition for access to the oral examination.</p> <p>The oral examination consists of an interview to ascertain the possession of the skills and the knowledge provided by the course, the computing capacity and an adequate display capacity. The candidate will have to answer at least to three topics concerning the program, with reference to the recommended texts. The assessment is expressed in thirtieths.</p> <p>Final assessment aims to evaluate whether the student has knowledge and understanding of the topics, and has acquired an independent judgment on specific cases.</p> <p>The final evaluation will be expressed in thirtieths and will be the average of the written and oral examinations. The threshold of sufficiency will be achieved when the student shows the knowledge and understanding of the topics at least in the general guidelines and has minimum application competencies in order to solve concrete cases; they must also have exhibiting and arguing skills that will</p>

	<p>enable them to pass their knowledge to the examiner. Below this threshold, the examination will be insufficient. The more, instead, the student is able to interact with the examiner with his arguments and exhibit skills, and the more his knowledge and application skills go into detail of the discipline being tested, the more the evaluation will be positive.</p> <p>Description of the evaluation methods  EvaluationVoteOutcome  Excellent30 - 30 and lodeExcellent knowledge of the topics, excellent properties of language, good analytical ability, the student is able to apply the knowledge to solve problems proposed.  Very good26-29Good mastery of the subjects, full ownership of the language, the student is able to apply the knowledge to solve problems proposed.  Good24-25Basic knowledge of the main topics, discrete properties of language, with limited ability to independently apply the knowledge to the solution of the proposed problems.  Satisfactory21-23The student does not have full command of the main teaching subjects but it has the knowledge, satisfactory property language, poor ability to independently apply the acquired knowledge.  Sufficient18-20Minimum basic knowledge of major teaching and technical language issues, very little or no ability to independently apply the acquired knowledge. His language is enough to communicate with the examiners.  InsufficientIt does not have an acceptable knowledge of the contents of the topics covered in the teaching.</p>
<b>EDUCATIONAL OBJECTIVES</b>	At the end of the course the student will be able to understand how the knowledge of some basic concepts of General Chemistry is the basis of almost all technologies and how they can be used in the performance of their profession. An important example concerns the graduated in biomedical engineering for which the basic concepts of Chemistry are fundamental for the study of biomaterials. However, the main goal is to provide the students with awareness of the vital role that the discipline has in the production of all types of materials used in the engineering field.
<b>TEACHING METHODS</b>	Frontal lessons and exercises
<b>SUGGESTED BIBLIOGRAPHY</b>	M. Schiavello e L. Palmisano "Fondamenti di Chimica" V Ed. Edises. L. Palmisano e M. Schiavello "Elementi di Chimica" Ed. Edises (in alternativa al primo). D. W. Oxtoby, H. P. Gillis, L. J. Butler "Chimica Moderna" V Ed. Edises (in alternativa al primo). F. Cacace, M. Schiavello "Stechiometria" Ed. Bulzoni (facoltativo). P. Giannoccaro - S. Doronzo "Elementi di Stechiometria" II Ed. Edises (facoltativo).

## SYLLABUS

Hrs	Frontal teaching
3	Introduction to the course. Fundamental laws of chemistry
2	Atomic theory
2	Periodic table of the elements
2	Inorganic compounds nomenclature
3	The chemical bond
1	The gaseous state
1	The liquid state
1	The solid state
3	Thermodynamics
2	Chemical kinetics
1	Phase diagrams for one-component systems
2	Two-component systems
2	Colligative properties
2	Chemical equilibrium
3	Ionic equilibria
1	Buffer solutions. Titration curves
1	Conductimetry
3	Electrochemistry
4	Organic chemistry. Hints of biochemistry
2	Nuclear chemistry
Hrs	Practice
1	Fundamental laws of chemistry

<b>Hrs</b>	<b>Practice</b>
3	The mole. Empirical and molecular formulas. Equivalent weight
3	Stoichiometry. Limiting reactant
2	The chemical bond. The hybrid orbitals
2	Red-ox reactions
2	Combustion reactions. Volume of combustion fumes.
3	Inorganic nomenclature. Structure formulas
2	The gaseous state
2	Thermodynamic's elements. Hess's law.
4	Two-component systems. Colligative properties
4	Chemical equilibrium
4	Ionic equilibria
3	Buffer solutions. Titration curves
2	Solubility product
3	Electrochemistry