



## Teaching Guide

Identifying Data					2020/21
Subject (*)	General Chemistry 1			Code	610G01007
Study programme	Grao en Química				
Descriptors					
Cycle	Period	Year	Type	Credits	
Graduate	1st four-month period	First	Basic training	6	
Language	Spanish				
Teaching method	Hybrid				
Prerequisites					
Department	Química				
Coordinador	Lopez Torres, Margarita	E-mail	margarita.lopez.torres@udc.es		
Lecturers	Lopez Torres, Margarita Vazquez Garcia, Digna	E-mail	margarita.lopez.torres@udc.es d.vazquezg@udc.es		
Web					
General description	<p>The course "Chemistry" of the Degree in Chemistry is part of the 60 credits of the Training Module Basic Science. Its purpose is to provide the students skills and knowledge homogeneous on the basic principles of chemistry on which will be developed, through specific subjects, skills own title.</p> <p>"Chemistry 1" is the first of four subjects where, for reasons of educational planning, was divided matter "Chemistry" in the curriculum of the UDC. It introduced, at a basic level and merely qualitative structure of matter, atoms, elements and compounds, based on both the model of interactions between atomic nuclei and electrons as the interactions between atoms; raising the relationship between structure and properties, and the greater or lesser ability of models for justify.</p>				



<b>Contingency plan</b>	<p>1. Modifications to the contents</p> <p>In the case of this matter there are not modifications of the contents.</p> <p>2. Methodologies</p> <p>*Teaching methodologies that are maintained</p> <ul style="list-style-type: none"> <li>- Workbook (Included in assessment)</li> <li>- Guest lecture / keynote speech</li> <li>- Problem solving (Included in assessment)</li> <li>- Mixed objective/subjective test (Included in assessment)</li> <li>- Workshop (Included in assessment)</li> <li>- Objective test (Included in assessment)</li> </ul> <p>All the Ordinary class hours will be realize virtually in the platforms of teleworking employed by the UDC. In case that part of the student cannot continue with face-to-face teaching, asynchronous means will be used (email, recordings of the classes, specific multimedia material ...)</p> <p>*Teaching methodologies that are modified</p> <p>3. Mechanisms for personalized attention to students</p> <ul style="list-style-type: none"> <li>- Email: it will employ to do questions, request virtual meetings, to resolve doubts, etc..</li> <li>- Moodle: Daily. According to the need of the students.</li> <li>- Teams: Periodically the teachers may call students to tutoring, in the most convenient times for each student, with the intention of receiving the necessary guidance. Regardless of the tutorials proposed by the teacher, the student may attend tutoring at his own request, as often as desired, and at the time that is most suitable, through individual virtual meetings or for groups of students.</li> </ul> <p>4. Modifications in the evaluation</p> <p>Evaluation will be realize employing platforms like Moodle, tools of the package Office 365 and available applications in Internet.</p> <p>*Evaluation observations:</p> <p>They will be the same that appear in the Teaching Guides Management, except that the references to the computation of the assistance, that will be compute with respect of the classes until the moment in which the face-to-face course finished.</p> <p>5. Modifications to the bibliography or webgraphy</p> <p>There are not modifications.</p>
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#### Study programme competences / results

Code	Study programme competences / results
A1	Ability to use chemistry terminology, nomenclature, conventions and units
A2	Ability to describe and account for trends in properties of chemical elements throughout the periodic table
A3	Knowledge of characteristics of the different states of matter and theories used to describe them
A6	Knowledge of chemical elements and their compounds, synthesis, structure, properties and reactivity
A8	Knowledge of principles of quantum mechanics and atomic and molecular structure
A12	Ability to relate macroscopic properties of matter to its microscopic structure
A14	Ability to demonstrate knowledge and understanding of concepts, principles and theories in chemistry
A25	Ability to recognise and analyse link between chemistry and other disciplines, and presence of chemical processes in everyday life
B2	Effective problem solving
B3	Application of logical, critical, creative thinking
B4	Working independently on own initiative
B5	Teamwork and collaboration
C1	Ability to express oneself accurately in the official languages of Galicia (oral and in written)

#### Learning outcomes

Learning outcomes	Study programme competences / results		
	A1	B2 B3 B4 B5	C1
Formulate and name simple inorganic and organic substances.	A1	B2 B3 B4 B5	C1
To know the main particles that form the matter, from the point of view of the Chemist (electrons and nuclei) and the composition of the atomic nucleus and its main reactions	A3 A8 A25	B2 B3 B4 B5	C1
To know critically and comparative the main atomic models and their historical development as well as their application to the study of periodic properties.	A2 A6 A8 A14	B3	C1
Know the main link models and their application to various types of chemical species and compare them to the molecular orbital model.	A3 A6 A8 A12 A14 A25	B2 B3 B4 B5	C1
Know the periodic table of the elements and properties of the atoms according to their position in the same.	A2 A6 A8 A12 A14 A25	B2 B3 B4 B5	C1

Contents	
Topic	Sub-topic
1.- Introduction	Matter and chemistry. Models. The scientific-experimental method. Composition of matter. Properties of matter
2.- Formulation and nomenclature	Formulation. Nomenclature
3.- The structure of matter and particle models	Matter as set nucleus and electrons. Rutherford atomic model. Bohr atomic model for the hydrogen atom. Limitations of the Bohr atomic model. Uncertainty Principle
4.- The wave mechanical model for the hydrogen atom	De Broglie's hypothesis. Stationary wave equation for Hydrogenoid System. Orbital functions. Orthonormality solutions to the equation and quantum numbers n, l ml. Electron energy Hydrogenoid System. Meaning of "Orbital Function";. Comparison between models of Bohr and Schrödinger. The wave functions. Graphical representation of the orbitals
5.- The wave mechanical model for polielectronic atoms	The wave equation for an atom with more electrons. Orbital model approach. Determination of the effective nuclear charge. Slater rules. The energy of the orbitals of the electron atoms. The electron spin quantum number. The Pauli exclusion principle. Electronic configurations
6.- Periodic Table and periodic properties of the elements	Electronic configuration and periodic table. Periodicity of atomic properties
7.- Introduction to bonding models	The wave equation for polynuclear systems. Models bond between atoms. Link models adapted to the types of chemicals
8.- Lewis Theory	Structure and properties of molecular substances. Lewis model. Bond order and bond strength and longitude. Resonance. Molecules that do not meet the octet rule. Limitations of the theory of Lewis



9.- Valence-Shell Electron-Pair Repulsion Theory	The theory of pair repulsion electron valence shell. Application of the model. Application of the model species with more than one central atom
10.- Valence Bond Theory	VTE in diatomic molecules. The model of "Electronic Cement". The valence bond model. Orbital hybridization. Resonance. Polar covalent bonds. The polarity of the bond in the VTE. Polar covalent bond strength
11.- Intermolecular Forces	The absolute temperature scale. Solids, liquids and gases. Van der Waals force. Hydrogen bonds
12.- Covalent Solids	Covalent solids. Some solid covalent structures
13.- Structure and bonding in metals	Metals: Property characteristics. Structure of Metals. Electronic Cement. The metallic bond: electron sea model
14.- Structure and bonding in salts	Definition and properties of salts. Structure salts. Ionic radii. A "Rule radii", Ionic bonding model. Calculation of the lattice energy. Covalent character of the bond in the salts. Electron density maps. Polarizing power and polarizability of the ions. Fajans rules. Consequences of participation in the covalent bond
15.- Molecular Orbital Theory	Limitations of VTE. Again the wave equation for polynuclear systems. OM diagram H <sub>2</sub> species. OM diagram of He <sup>2+</sup> and He <sub>2</sub> species. Binding order in the TOM. OM of other diatomic molecules. The "orbital investment", OM for the molecule BeH <sub>2</sub> , an example of polyatomic molecule. Molecular orbitals of polar species. Delocalized systems. Treatment of the electronic structure of metals by TOM: Bands model. The pattern of bands applied to covalent solids. Treating the salts by MOM
16.- The atomic nucleus	The atomic nucleus. Protons and neutrons. Radioactive decay reactions. Beta-particle emission. + Beta particle emission. Electron capture. Emission of alpha particles. Gamma emission radiation. Half-life. Nuclear fission. Nucleosynthesis. Nuclear energy. The Re

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student's personal work hours	Total hours
Workbook	A1 A2 A3 A6 A8 A12 A14 A25 B4	0	15	15
Guest lecture / keynote speech	A1 A2 A3 A6 A8 A12 A14 A25 B4 B5	28	38	66
Problem solving	A1 A2 A3 A6 A8 A12 A14 B2 B3 C1	9	23	32
Mixed objective/subjective test	A1 A2 A3 A6 A8 A12 A14 B2 B3 C1	3	9	12
Workshop	A1 A2 A3 A6 A8 A12 B2 B3 B5 C1	10	12	22
Objective test	A1 A2 A3 A6 A8 A12 B2 B3 C1	1	0	1
Personalized attention		2	0	2

(\*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies	
Methodologies	Description
Workbook	So that students can make the most of the guest lecture, the corresponding issue must be first read followed by responses a test to based on this reading. The completion of these tests will be essential in order to be qualified in classes and workshops problems related contents.

Guest lecture / keynote speech	In the classes will review the contents of the relevant issues, indicating their most important aspects, particularly those fundamental or more difficult to understand concepts to students.
Problem solving	Problem solving will be in small group and will be dedicated to solving problems and questions raised in advance of the student so that it can work on them before the corresponding session. Uploading the answers to the questions to Moodle will be essential to be evaluated in the corresponding problema solving class.
Mixed objective/subjective test	The test be held on the date set in the timetable agreed by the Faculty Board. It aims to contribute to the assessment of the level of skills acquired by students in the whole course.
Workshop	The workshops are designed as a set of eminently practical activities, carried out both in large group and small group, in which the student must participate actively. Its main objective is to complete and deepen the most relevant aspects and / or difficult to understand. Each workshop is associated with carrying out a previous work and uploading the work to Moodle will be essential to be evaluated in the corresponding class. At the end of the workshop, using applications available on the Internet, a multiple-choice test will be carried out to assess the degree of assimilation of the student of the topics covered.
Objective test	Periodically, in classes, problem solving or workshops will conduct some short exercises both to assessing student achievement as the teacher's guidance on the issues learn in their class. Besides, this activity tends to encourage the student to perform continuously the effort required to study chemistry 1

#### Personalized attention

Methodologies	Description
Workshop Problem solving	<p>The teaching methodology proposed is based on the student's work, which becomes the main protagonist of the teaching-learning process. For the student to obtain optimal performance of their effort it is that there is a continuous interaction and closer student-teacher, so that the latter can lead the first in this process capital. This interaction will especially in workshops and problem solving sessions. Through student-faculty interaction, as well as the different evaluation activities will be determined to what extent the students reached the competency targets set in each unit, and determine students who need personalized attention through individualized tutoring. Therefore, periodically or teachers may call students to tutoring, to be held in the most convenient times for each student, with the intention of receiving the necessary guidance.</p> <p>Regardless of the tutorials proposed by the teacher, the student may attend tutoring at his own request, as often as desired, and the time that is most suitable.</p> <p>According to the "norma que regula o réxime de dedicación ao estudo dos estudantes de grao na UDC" (Art.3.b e 4.5) and "normas de avaliación, revisión e reclamación das cualificacións dos estudos de grao e mestrado universitario" (Art. 3 e 8b), students with recognition of part-time dedication and assistance exemption should be able to participate in a training methodology and associated teaching activities that would allow the achievement of the training objectives. Therefore, in the subject General Chemistry 1 (Química 1), the percentage of exemption would be preset in a first interview with the students, taking into account once known their personal situations. At this point, students can participate in a personalized tutorial system for guidance and evaluation, with at least five individualized sessions, which will serve for the orientation of students in their autonomous work as well as for monitoring their progression during the course and evaluating the degree of competence development reached. Regarding this last point, the tutorials will serve to carry out those activities included in the Objective Test methodology and which correspond to a 25% of the final grade for the course.</p>

#### Assessment

Methodologies	Competencies / Results	Description	Qualification
Objective test	A1 A2 A3 A6 A8 A12 B2 B3 C1	Periodically will some exercises of multiple choice or short answer according to what indicated in the methodology section will be made	25



Workshop	A1 A2 A3 A6 A8 A12 B2 B3 B5 C1	Uploading to Moodle the previous work will be essential to be evaluated in the corresponding workshop.  In this activity, the active participation and the level of knowledge demonstrated by the students in the multiple-choice test that will be carried out at the end of each workshop will be taken into account.	15
Mixed objective/subjective test	A1 A2 A3 A6 A8 A12 A14 B2 B3 C1	It will consist of questions to develop both as test questions, formulation and problems, similar to solved during course. It will celebrate in the end of semester	40
Problem solving	A1 A2 A3 A6 A8 A12 A14 B2 B3 C1	This activity will take into account the active student participation. and the level of knowledge demonstrated by the students will be evaluated, both when solving the exercises and in the debate with their classmates  Uploading to Moodle the answers of the Problem Sheet will be essential to be evaluated in the corresponding class of problems.	15
Workbook	A1 A2 A3 A6 A8 A12 A14 A25 B4	What is learned in the reading will be evaluated through a test that will be carried out in Moodle after having read the recommended readings.	5

#### Assessment comments

To pass the subject, it will be necessary to get at least 50 points among the different assessment activities (mixed test, objective tests, workbook, problem solving and workshops), as well as obtain a minimum score of 20 points (out of 40) in the mixed test . If is not possible to achieve the minimum score in the mixed test, although the average be greater than or equal to 50 points (out of 100) will be listed as not passing matter (4.5)

To obtain a rating of not submitted the students, students may not have participated in more than 25% of problem solving classes and workshops, or perform the mixed test. Students to be evaluated in the so-called "second chance" Will repeat the mixed test and those activities subject to evaluation will be repeated in which the pass was not obtained (neither workshops nor problem solving classes are included). The final grade is calculated according to the established percentages and the previously established restrictions. Students assessed in the second opportunity can only be granted with a "Matrícula de Honra" (the highest grade awarded to outstanding students) only if the maximum number of these distinctions according to the regulations were not awarded to students passing the course in the first opportunity. In the case of exceptional, objective and adequately justified circumstances, the responsible teacher could totally or partially exempt any member of the student body from concluding the continuous assessment process. The students who are in this circumstance must pass a specific exam that leaves no doubt about the achievement of the skills of the subject. Those students having a part-time dedication to the course, and thus waiver of assistance to the on-site academic activities according to the regulations of UDC, the grade obtained in the activities associated with the personalized tutoring system will correspond to the evaluation of the objective testing methodology, that is to say, 25% of the final grade. The remaining 75% of said final grade will be determined through the results obtained by the student in the mixed test.

As regards successive academic courses, the teaching-learning process, including assessment, refers to an academic course, and therefore would start again with a new course, including all assessment activities and procedures that were scheduled for that course.

#### Sources of information

<b>Basic</b>	<ul style="list-style-type: none"> <li>- Petrucci, R. H.; Herring, F. G.; Madura, J. D.; Bissonnette, C (2017). Química General, 11 Ed.. Madrid, Pearson Education</li> <li>- Petrucci, R. H.; Herring, F. G.; Madura, J. D.; Bissonnette, C. (2011). Química General, 10 Ed.. Madrid, Pearson Education</li> <li>- Petrucci, R. H.; Hartwood, W. S.; Herring, F. G. (2003). Química General, 8ª Ed. . Madrid, Pearson Education</li> </ul> <p>As tres referencias corresponden a distintas edicións do mesmo texto, e pódense usar indistintamente.</p>
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<b>Complementary</b>	<ul style="list-style-type: none"><li>- J. Casabó i Gispert (1996). Estructura Atómica y Enlace Químico.. Barcelona, Editorial Reverte</li><li>- Emilio Quiñoá Cabana; Ricardo Riguera Vega; José Manuel Vila Abad. (2005). Nomenclatura y formulación de los compuestos orgánicos una guía de estudio y autoevaluación. Madrid, McGraw-Hill</li><li>- Emilio Quiñoá Cabana; Ricardo Riguera Vega; José Manuel Vila Abad. (2006). Nomenclatura y formulación de los compuestos inorgánicos una guía de estudio y autoevaluación. Madrid, McGrawHill</li></ul>
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## Recommendations

### Subjects that it is recommended to have taken before

### Subjects that are recommended to be taken simultaneously

Chemistry Laboratory 1/610G01010

### Subjects that continue the syllabus

General Chemistry 2/610G01008

General Chemistry 3/610G01009

### Other comments

To deal with warranty estudo of this course the student needs the knowledge of chemistry own the bachelor

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