UNIVERSIDADE DA CORUÑA

| Teaching Guide | | | | |
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| Identifying Data | | | | 2015/16 |
| Subject (*) | Química 1 | | Code | 610G01007 |
| Study programme | Grao en Química | | | |
| Descriptors | | | | |
| Cycle | Period | Year | Type | Credits |
| Graduate | 1st four-month period | First | FB | 6 |
| Language | SpanishGalician | | | |
| Teaching method | Face-to-face | | | |
| Prerequisites | | | | |
| Department | Química Fundamental | | | |
| Coordinador | Martinez Cebeira, Monstserrat | E-mail | monserrat.martinez.cebeira@udc.es | |
| Lecturers | García Romero, Marcos Daniel<br>Martinez Cebeira, Monstserrat<br>Riveiros Santiago, Ricardo | E-mail | marcos.garcia1@udc.es<br>monserrat.martinez.cebeira@udc.es<br>ricardo.riveiros@udc.es | |
| Web | | | | |
| General description | 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.<br><br>"Chemistry 1" is the first of four subjetcs 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. | | | |

| Study programme competences | |
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| Code | Study programme competences |
| 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 | | | |
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| Learning outcomes | Study programme competences | | |
| Formular e nomear sustancias inorgánicas e orgánicas sinxelas. | A1 | B2<br>B3<br>B4<br>B5 | C1 |

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| Coñecer as principais partículas que forman a materia, dende o punto de vista do Químico (electróns e núcleos). | A3<br>A8<br>A25 | B2<br>B3<br>B4<br>B5 | C1 |
| Coñecer a composición do núcleo atómico e as súas principais reaccións. | A1<br>A8<br>A14<br>A25 | B2<br>B3<br>B4<br>B5 | C1 |
| Coñecer de forma crítica e comparada os principais modelos atómicos e o seu desenvolvemento histórico así como a súa aplicación ao estudo das propiedades periódicas. | A2<br>A8<br>A12<br>A14<br>A25 | B2<br>B3<br>B4<br>B5 | C1 |
| Coñecer a táboa periódica dos elementos e as propiedades dos átomos segundo a súa posición na mesma. | A2<br>A6<br>A8<br>A12<br>A14<br>A25 | B2<br>B3<br>B4<br>B5 | C1 |
| Coñecer os principais modelos de enlace e a súa aplicación aos diversos tipos de especies químicas. | A3<br>A6<br>A8<br>A12<br>A14<br>A25 | B2<br>B3<br>B4<br>B5 | C1 |
| Aplicar o modelo de orbitais moleculares á descrición da estrutura electrónica dos principais tipos de especies | A6<br>A8<br>A12<br>A14<br>A25 | B2<br>B3<br>B4<br>B5 | C1 |

| Contents | |
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| **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 |

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| 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 radios". Ionic bonding model. Calculation of the laticce 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 H2 species. OM diagram of He2 + and He2 species. Binding order in the TOM. OM of other diatomic molecules. The "orbital investment." OM for the molecule BeH2, 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. Gagma emission radiation. Half-life. Nuclear fission. Nucleosynthesis. Nuclear energy. The Re |

| Planning | | | | |
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| Methodologies / tests | Competencies | Ordinary class hours | Student?s personal work hours | Total hours |
| Guest lecture / keynote speech | A1 A2 A3 A6 A8 A12 A14 A25 B4 B5 | 28 | 53 | 81 |
| Problem solving | A1 A2 A3 A6 A8 A12 B2 B3 | 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 | 10 | 12 | 22 |
| Objective test | A1 A2 A3 A6 A8 A12 A14 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 | |
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| Methodologies | Description |

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| 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. So that students can make the most of the class, 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. |
| Problem solving | Problem solvent 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. At the beginning of each session, students must submit the original work (it is recommended to keep a copy, since the original is not will be returned), which will be periodically reviewed by the professor, not only for assessment purposes, but also to provide adequate support to the study of matter. |
| 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. They also resolve doubts about any aspect related to problem solving class and workshops, etc |
| Objective test | Periodically, in classes, problem solving or workshops will conduct some short exercices 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 | |
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| **Methodologies** | **Description** |
| Problem solving<br>Workshop | 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.<br>Regardless of 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. |

| Assessment | | | |
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| **Methodologies** | **Competencies** | **Description** | **Qualification** |
| 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 and problems, similar to solved during course. It will celebrate in the end of semester | 50 |
| Problem solving | A1 A2 A3 A6 A8 A12 B2 B3 | Problem solving and the workshops together will a maximum of 25 points total.<br>This activity will take into account student participation. Also could be evaluated the exercices that student delivered before class of problems, as well as some brief exercises that can be made in this class | 25 |
| Workshop | A1 A2 A3 A6 A8 A12 B2 B3 | Problem solving and workshops, will evaluated with maximum of 25 points total.<br>This activity will take into account the participation and level of knowledge shown by the students. I could also take account the exercices that students have to deliver before some of the workshops, as well as some brief exercises that students can be made in class | 0 |
| Objective test | A1 A2 A3 A6 A8 A12 A14 B2 B3 C1 | Periodically will some exercices of multiple choice or short answer according to what indicated in the methodology section will be made | 25 |

| Assessment comments |
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| The rating is the sum of the following contributions:<br><br>- Mixed objective: up to 50 points<br><br>- Objective tests: up to 25 points<br><br>- problem solving and workshops: up to 25 points. Although responses to pre-test the theoretical sessions are not part of the assessment of the matter, they are considered an essential tool in the teaching methodology designed. Consequently, those students who do not meet any test, or do so in a grossly negligent manner, will not be evaluated in classes problem solving or related workshops.<br><br>To pass the subject it will be necessary to get at least 50 points between the different assessment activities (mixed testing, objective testing, troubleshooting and workshops) and obtain a minimum score of 20 points (out of 50) 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).<br><br>Since the rating is based on the model of continuous assessment, specifically assess student progression throughout the semester could be added maximum of 1 point to the final grade.<br><br>Students who do not participate in workshops and problem solvent will score zero points in this section on two occasions or oportunities.<br><br>The student will have a rating of not submitted when making less than 25% of academic activities scheduled and is not presented at the mixed objective.<br><br>Students to be evaluated in the so-called "second chance" can only obtain qualified with the maximun if the maximum number of these to the corresponding course was not fully covered in the "first chance."<br><br>In the case of exceptional circumstances objectivables and properly justified, the professor may waive in whole or in part the student for the continuous process. People in this circumstance must pass a specific test that leaves no doubt on the achievement of the competences of the subject.<br><br>As is referring to successive academic years, the process of teaching and learning, including assessment, refers to an academic year, and therefore would start with a new program, including all activities and evaluation for that course. |

| Sources of information | |
|---|---|
| Basic | - Petrucci, R. H.; Hartwood, W. S.; Herring, F. G. (2003). Química General, 8ª Ed.. Pearson Education, Madrid<br>- Petrucci, R. H.;  Herring, F. G.; Madura, J. D.; Bissonnette, C. (2011). Química General, 10 Ed.. Pearson Education, Madrid<br>Ambas referencias corresponden a distintas edicións do mesmo texto, e pódense usar indistintamente. |
| Complementary | - J. Casabó i Gispert (1996). Estructura Atómica y Enlace Químico. Barcelona, Editorial Reverté<br><br /> |

| Recommendations |
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| Subjects that it is recommended to have taken before |
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| Subjects that are recommended to be taken simultaneously |
| Química 4/610G01010 |

| Subjects that continue the syllabus |
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| Química 2/610G01008 |
| Química 3/610G01009 |
| **Other comments** |
| To deal with warranty estudo of this course the student needs the knowledge of chemistry own the bachelor |