Teaching Guide				
Identifying Data				2020/21
Subject (*)	Inorganic Chemistry 3		Code	610G01023
Study programme	Grao en Química			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	1st four-month period	Third	Obligatory	6
Language	SpanishGalicianEnglish			
Teaching method	Hybrid			
Prerequisites				
Department	Química			
Coordinador	Esteban Gomez, David	E-mail	david.esteban@udc.es	
Lecturers	Castro Garcia, Socorro Esteban Gomez, David Platas Iglesias, Carlos Señaris Rodriguez, Maria Antonia	E-mail	socorro.castro.garcia@udc.es david.esteban@udc.es carlos.platas.iglesias@udc.es m.senaris.rodriguez@udc.es	
Web				
General description	?Inorganic Chemistry 3? is a compulsory subject in the 1st semester of the 3rd year of the Degree in Chemistry. This subject belongs to the module "Inorganic Chemistry" and is dedicated to the study of Coordination Compounds and Inorganic Solids, both from the standpoint of the structures and bonding, as the reactivity of the former. For the study of this subject is essential to have well-established skills of ?Inorganic Chemistry 1?, ?Inorganic Chemistry 2?, ?Physical Chemistry 1? and ?Physical Chemistry 2? (all of the 2nd year). ?Inorganic Chemistry 3? serves as the foundation for ?Inorganic Chemistry 4? (3rd year, 2nd semester), ?Advanced Inorganic Chemistry? and ?Materials Science? courses (both of the 4th year).			

Contingency plan	1. Modifications in the contents. In principle, the contents are maintained in their entirety. If necessary for reasons of force majeure, it will be possible to opt for a more general presentation, which in any case will cover all the most relevant aspects of the subject. 2. Methodologies * Teaching methodologies that are maintained The methodologies will be maintained, but will be carried out in "online mode", i.e. using the TIC tools available to the institution. In the case that part of the students cannot connect and follow the classes in real time, asynchronous methods will be used (e-mail, recordings of the exhibition sessions, more personalized tutorials...). * Teaching methodologies that change Objective tests will be online tests that will be conducted using Moodle or equivalent tools, tracked by TEAMS. 3. Mechanisms of personalized attention to students. Students will receive tutorials through the Teams platform or by corporate email. 4. Modifications in the evaluation. If all students could continue with the non-presential teaching without difficulty, it will be evaluated in the same way as in the presential teaching. Students who are unable to follow synchronous activities online will be assessed for equivalent activities performed asynchronously. * Evaluation observations: None. 5. Modifications to the bibliography or webgraphy. There are no changes in the bibliography / webgraphy.

Study programme competences / results	
Code	Study programme competences / results
A1	Ability to use chemistry terminology, nomenclature, conventions and units
A3	Knowledge of characteristics of the different states of matter and theories used to describe them
A4	Knowledge of main types of chemical reaction and characteristics of each
A5	Understanding of principles of thermodynamics and its applications in chemistry
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
A9	Knowledge of structural characteristics of chemical and stereochemical compounds, and basic methods of structural analysis and research
A10	Knowledge of chemical kinetics, catalysis and reaction mechanisms
A14	Ability to demonstrate knowledge and understanding of concepts, principles and theories in chemistry
A15	Ability to recognise and analyse new problems and develop solution strategies
A16	Ability to source, assess and apply technical bibliographical information and data relating to chemistry
A24	Ability to explain chemical processes and phenomena clearly and simply
A25	Ability to recognise and analyse link between chemistry and other disciplines, and presence of chemical processes in everyday life
B1	Learning to learn
B2	Effective problem solving
B3	Application of logical, critical, creative thinking
B4	Working independently on own initiative
B5	Teamwork and collaboration
B7	Effective workplace communication

C1	Ability to express oneself accurately in the official languages of Galicia (oral and in written)
C2	Oral and written proficiency in a foreign language
C6	Ability to assess critically the knowledge, technology and information available for problem solving
C7	Acceptance as a professional and as a citizen of importance of lifelong learning
C8	Understanding role of research, innovation and technology in socio-economic and cultural development

Learning outcomes			
Learning outcomes	Study programme competences / results		
To know the structure and the nature of chemical bonding in coordination compounds.	A1 A3 A6 A8 A9 A14 A15 A16 A24 A25	B1 B2 B3 B4 B5 B7	C1 C2 C6 C7 C8
To know the thermodynamic aspects related to the stability of coordination compounds.	A1 A5 A9 A14 A15 A16	B1 B2 B3 B4 B5 B7	C1 C2 C6 C7 C8
To know the most important reaction mechanisms for coordination compounds.	A1 A4 A9 A10 A14 A15 A16	B1 B2 B3 B4 B5 B7	C1 C2 C6 C7 C8
To know the structure of inorganic solids.	A1 A3 A6 A9 A14 A15 A16	B1 B2 B3 B4 B5 B7	C1 C2 C6 C7 C8
To know the microstructure of inorganic solids.	A1 A6 A9 A14 A15 A16 A24 A25	B1 B2 B3 B4 B5 B7	C1 C2 C6 C7 C8

To know the nature of chemical bonding in inorganic solids.	A1 A3 A5 A6 A8 A9 A14 A15 A16 A24 A25	B1 B2 B3 B4 B5 B7	C1 C2 C6 C7 C8

Contents	
Topic	**Sub-topic**
1.- Introduction to Coordination Chemistry.	Introduction
2.- Bonding in coordination compounds.	- Valence bond theory - Crystal field theory - Molecular orbital theory
3.- Thermodynamic stability of coordination compounds.	- Introduction: stability/instability vs. inertia/lability - Stability constans - Factors that affect the stability of complexes
4.- Reaction mechanisms of coordination compounds.	- Ligand substitution reactions - Redox reactions
5.- Introduction to Solid State Chemistry.	Introduction
6.- Ideal solids: Structural aspects and bonding.	- Structures of solids - Bonding in solids: ionic model and band model
7.- Real solids: defects in solids, examples of inorganic solids with relevant properties.	- Defects in solids - Examples of solids with important properties

Planning				
Methodologies / tests	**Competencies / Results**	**Teaching hours (in-person & virtual)**	**Student?s personal work hours**	**Total hours**
Guest lecture / keynote speech	A1 A25 B7 C2 C8	28	42	70
Workshop	A5 A6 A8 A9 A10 A14 A16 B5 C2	6	21	27
Problem solving	A3 A4 A15 A24 B1 B2 B3 B4 C1 C2 C6 C7	7	24.5	31.5
Objective test	A1 A4 A5 A6 A15 B1 B2 B3 C1	1	0	1
Mixed objective/subjective test	A1 A3 B2 B3 B4 B7 C1 C2	4	15.5	19.5
Personalized attention		1	0	1
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	**Description**
Guest lecture / keynote speech	Lectures to introduce the most relevant issues related to the contents of the course, highlighting the most important aspects.
Workshop	Practical activities to aid the understanding of the more difficult aspects of the course.

Problem solving	Classes oriented to solve problems and exercises previously proposed to the students, so that they can work on them in advance.
Objective test	Periodically, the students will perform a series of short-term or short-answer tests during the problem solving sessions. These objective test are designed both for the evaluation of the degree of acquisition of competences and the consolidation of the contents seen in the lectures. This activity will not only track the evolution of students, but also serve to detect those aspects of the subject that present a greater difficulty of understanding.
Mixed objective/subjective test	Final written exams will take place following the schedule agreed by the institution with the aim to evaluate the global knowledge, understanding and skills acquired by each student. They may include short questions, multiple choice questions, and problems similar to those solved throughout the course

Personalized attention	
Methodologies	**Description**
Problem solving Workshop Guest lecture / keynote speech	The didactic methodology proposed for this course relies on the individual work of the student, which is the main responsible of the educational process. Nevertheless, it is of crucial importance to achieve a close interaction between the student and the instructor, which will guide the student throughout the process. Thanks to this interaction and the different assessment activities planned for the course the instructor will determine the extent to which the student has achieved the objectives of each topic and provide appropriate advice individually. This guidance will take place at the tutoring hours of the lecturer (the timetable will be indicated at the beginning of the course) or at any other moment agreed by the student and the instructor. Students can ask for additional tutoring sessions if required. 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, follow different dynamics that require additional personalized attention. The waiver applied to each student is fixed after a personal interview with the instructor on the basis of the student's personal circumstances. The tutoring sessions are scheduled in this interview upon agreement between the student and the instructor, who fixes the number of problem-solving workshops to be graded using this methodology and the deadlines for the presentation of the problem-sheets. The grade obtained by the student in these activities will correspond to the average of the grades achieved for each workshop. The tutoring sessions focus on discussions about the contents of the course and revision of the problem sheets solved by the student. The student might also have short tests to assess the degree of compliance with the objectives of the course.

Assessment			
Methodologies	**Competencies / Results**	**Description**	**Qualification**
Problem solving	A3 A4 A15 A24 B1 B2 B3 B4 C1 C2 C6 C7	Aspects to be evaluated: The solution of the proposed problems and exercises in the seminars by the students, their participation in the discussions, and their interaction with the other students.	5
Workshop	A5 A6 A8 A9 A10 A14 A16 B5 C2	Aspects to be evaluated: the exercises and activities carried out in the working sessions, the participation on the discussions, the interaction with the other students.	5
Mixed objective/subjective test	A1 A3 B2 B3 B4 B7 C1 C2	The final exam is designed as a joint mixed test that includes short questions, multiple choice questions, and problems similar to those solved throughout the course.	60
Objective test	A1 A4 A5 A6 A15 B1 B2 B3 C1	Periodically, the students will perform a series of short-term or short-answer tests during the problem solving sessions. These objective test are designed both for the evaluation of the degree of acquisition of competences and the consolidation of the contents seen in the lectures. This activity will not only track the evolution of students, but also serve to detect those aspects of the subject that present a greater difficulty of understanding.	30

Assessment comments
The final grade is the sum of: - "Mixed test": up to 6 points. - "Problem solving" + "workshop": up to 1 point. - "Objective tests": up to 3 points. The assessment through mixed-tests will be split into two parts (Coordination Chemistry ans Solid State Chemistry). It is compulsory for the students to obtain a minimum of 2.7 points (out of a maximum of 6) in both two parts to pass the course. The grade of the mixed-test will be expressed as the average mark obtained in both parts. Students that obtain less than 2.7 points in one or the two parts will be graded with the lowest mark among the two. In the latter case, although the total sum of the marks obtained in the final test, seminars, workshops and objective tests was higher than 5.0 points, the subject will appear as "not passed" (4.5 points). In the official exams, named as 1st and 2nd opportunities, students will be assessed with a final exam (in case the marks of the two parts were lower than 2.7), or can choose to have an exam just of the part in which they obtained less than 2.7 points). The grade obtained from participation in seminars, workshops and objective tests will apply to both the assessment in 1st and 2nd opportinities. Passing the course will require obtaining a minimum of 5.0 points (out of a maximum of 10) that will be calculated considering all the different marks obtained in the mixed tests, workshops, problem solving sessions and objective tests (It is compulsory to obtain a minimun of 2.7 points in the mixed test). Given that the course applies a continuum assessment model, the progress of the students during the semester can be awarded with up to one extra point, which will be added to the final grade if the mark in mixed tests is 2.7 or higher. The student will be graded if his/her participation in the course represents more than 20% of the global activities of the course. In accordance with the regulations (?Probas de Avaliación e Actas de Cualificación de Grao e Mestrado?), the "2nd opportunity" is only a second chance for the final exam (?mixed test?). The grade on this 2nd opportunity of the ?mixed test? will be added to those obtained during the course in ?problem solving? + ?workshops? . The percentages are the same as in the "1st opportunity". ?Matricula de honor (MH)? is the highest grade, awarded to very outstanding students having passed the course in the ?1st opportunity?. MH can be achieved in the "2nd opportunity" only if still available. Only in very exceptional circumstances (adequately justified) the student may be exempted from the on going evaluation process. In that case, he must pass a special examination to prove, without any doubt, the overall level of knowledge and skills. The teaching methodology and all activities performed during the course are designed according to a continuous evaluation model scheduled for a single academic year. Thus, the possibility of transferring partial qualifications to successive academic courses is not allowed. 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, will be assessed as follows: 40% of the overall grade corresponds to the assessment of the personal work of the student (solution of problem-sheets), short tests and the personal interviews. The grades corresponding to this part are valid for both the first (June) and second (July) opprotunities. The remaining 60% of the grade corresponds to the assessment of the mixed test. Students have a second chance to be assessed with a mixed test in the 2nd opportunity. The grade obtained in the 2nd opprtunity for the mixed test replaces that obtained in the 1st one. Given that the assessment of the course is based on a continuum-assessment model, students that do not pass the course will be treated as new students in the subsequent academic years.

Sources of information

Basic	- J. Ribas Gispert (2008). "Coordination Chemistry" (versión en ingles de "Química de Coordinación"). Willey-VCH, Weinheim - L. Smart & E. Moore (1992). "Solid State Chemistry: an Introduction". Chapman & Hall, London - J. Rivas Gispert (2000). "Química de Coordinación". Ediciones Omega S.A. - P. W. Atkins, T. L. Overton, J. P. Rourke, M. T. Weller y F. A. Armstrong (2008). "Química Inorgánica de Shriver y Atkins", Versión en español de la 4ª edición de "Shriver and Atkins' Inorganic Chemistry". McGraw-Hill Interamericana - P. W. Atkins, T. L. Overton, J. P. Rourke, M. T. Weller and F. A. Armstrong. (2009). "Shriver and Atkins' Inorganic Chemistry" 5th ed.. W. H. Freeman and company, New York - L. Smart & E. Moore (1995). ?Una introducción a la química del estado sólido?, versión en español de "Solid State Chemistry: an Introduction". Ed. Reverté, Barcelona - A.R. West (1984). "Solid State Chemistry and its Aplications". John Wiley & Sons, New York - M.T. Weller (1999). "Inorganic Materials Chemistry". Oxford University Press, Oxford Os seguintes recursos bibliográficos están tamén dispoñibles como textos electrónicos a través de diferentes plataformas de consulta: - Introduction to Coordination Chemistry, G. A. Lawrance, disp. vía: Wiley Ebooks (AP). - Inorganic Chemistry, C. Cox, disp. vía: EBSChost Ebooks. - Descriptive Inorganic Chemistry, J. E. House, disp. vía: Elsevier ScienceDirect Books Complete. - Descriptive Inorganic Chemistry (3rd edition), J. E. House, disp. vía: Elsevier ScienceDirect Books Complete. - Solid State Chemistry (3rd edition), L. Smart, disp. vía: EBSChost Ebooks. - Inorganic Structural Chemistry (2nd edition), U. Müller, disp. vía: Wiley Ebooks (AP).
Complementary	- S. F. A. Kettle (1998). "Physical Inorganic Chemistry. A Coordination Chemistry Approach". Oxford University Press - A.F. Wells (1984). ?Structural Inorganic Chemistry? 5th Ed.. Oxford Univesity Press, London - A.F. Wells (1978). ?Química inorgánica estructural? Versión española de la 4ª Ed.. Ed. Reverté, Barcelona

Recommendations
Subjects that it is recommended to have taken before
Physical Chemistry 1/610G01016 Physical Chemistry 2/610G01017 Inorganic Chemistry 1/610G01021 Inorganic Chemistry 2/610G01022
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
Inorganic Chemistry 4/610G01024 Advanced Inorganic Chemistry/610G01025 Materials Science/610G01035
Other comments