UNIVERSIDADE DA CORUÑA

Teaching Guide				
Identifying Data				2015/16
Subject (*)	Complexos metálicos		Code	610509010
Study programme	Mestrado en Investigación Química e Química Industrial			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	1st four-month period	First	Optativa	3
Language	Spanish			
Teaching method	Face-to-face			
Prerequisites				
Department	Química Fundamental			
Coordinador	Fernandez Lopez, Alberto A.	E-mail	alberto.fernandez@udc.es	
Lecturers	Fernandez Lopez, Alberto A. Lopez Torres, Margarita	E-mail	alberto.fernandez@udc.es margarita.lopez.torres@udc.es	
Web				
General description	The subject ?Metal Complexes? is part of the Synthetic Chemistry profile included in the ?Specialized Training? module of the Chemical Research and Industrial Chemistry Master. This module is dedicated to study the synthesis of representative chemicals with both, a research and an industrial focus. Metal complexes show a wide structural diversity which ranges from the molecular dimension, passing through supramolecular aggregates, mono- and bi- and three- dimensional polymers to the Metal Organic Frameworks (MOF´s). Because of this diversity, these compounds show a wide range of properties and applications. Considering this, metal complexes deserve special attention due to their particular characteristics and synthetic methods.			

Study programme competences	
Code	Study programme competences
A1	Define concepts, principles, theories and specialized facts of different areas of chemistry.
A2	Suggest alternatives for solving complex chemical problems related to the different areas of chemistry.
A3	Apply materials and biomolecules in innovative fields of industry and chemical engineering.
B1	Possess knowledge and understanding to provide a basis or opportunity for originality in developing and / or applying ideas, often within a research context
B2	Students should apply their knowledge and ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study.
B3	Students should be able to integrate knowledge and handle complexity, and formulate judgments based on information that was incomplete or limited, include reflecting on social and ethical responsibilities linked to the application of their knowledge and judgments.
B7	Identify information from scientific literature by using appropriate channels and integrate such information to raise and contextualize a research topic
B10	Use of scientific terminology in English to explain the experimental results in the context of the chemical profession
B11	Apply correctly the new technologies to gather and organize the information to solve problems in the professional activity.

Learning outcomes			
Learning outcomes	Study programme competences		
Be able to design new routes to prepare and isolate coordination compounds	AC1	BC1 BC2 BC3 BC7 BC10 BC11	
Be able to identify the chirality in mononuclear coordination complexes and identify its origin	AC2		

Describe the factors that imply activation small molecules after coordination to metal centres and their applications.	AC1 AC2 AC3		
Describe the mechanisms of ligand substitution reactions and redox reactions in coordination compounds and their application in organic synthesis.	AC1 AC2 AC3		

Contents	
Topic	**Sub-topic**
Coordination compounds: a short introduction	Definition of coordination compound Constitution of coordination compounds Coordination number and stoichiometry Preparation methods
Chirality in coordination compounds	Stereoisomers and chirality Nomenclature of chiral complexes Origin of chirality and examples Preparation of chiral complexes
Activation of small molecules by coordination to a metal centre	Coordination modes of small molecules; dihydrogen, dioxygen and dinitrogen. Modification of the reactivity of small molecules due to coordination
Present applications and future perspectives of coordination compounds	Metal complexes in asymmetric catalysis. Main auxiliary ligands. Interesting catalytic processes: asymmetric hydrogenation, and asymmetric hydroformylation Dioxygen, dinitrogen and dihydrogen complexes in nature and their applications.

Planning				
Methodologies / tests	**Competencies**	**Ordinary class hours**	**Student?s personal work hours**	**Total hours**
Problem solving	A1 A2 B1 B2 B3 B7 B10 B11	3	12	15
Case study	A1 A2 B2 B3 B7 B10 B11	4	16	20
Mixed objective/subjective test	A1 A2 A3 B3 B7	3	0	3
Guest lecture / keynote speech	A1 A2 A3 B1 B7 B10	12	24	36
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**
Problem solving	Classes dedicated to the solution ad correction of problems and questions, which will be given to the students prior to the class. The students must try to solve the problems and questions before the class. Tutorial are available to assist the students Attendance to problem solving classes is compulsory
Case study	Classes dedicated to the study of one or more problems given in the case format. The students must discuss and solve these problems working in groups if possible. The material necessary for the class will be given to the students before the class. Tutorial are available to help the students to approach conveniently the case without excessive dedication. Attendance to case study classes is compulsory
Mixed objective/subjective test	Mixed test consisting of questions of short or large answer, problems, objective questions etc. The test is designed to assess the acquisition of competences, particularly specific competences

Guest lecture / keynote speech	The lectures in which the contents of the subject will be explained with the assistance of illustrative examples. The class slides will be available, prior to the class. In some cases, if the number of students and their characteristics are adequate complementary methodologies as, for example, the case study or analyses of bibliographic sources might be used. The active participation of students will be encouraged. Attendance to lectures is not compulsory by highly advisable.

Personalized attention	
Methodologies	**Description**
Guest lecture / keynote speech Case study Problem solving Mixed objective/subjective test	Consist of two tutorials dedicated to help the students with the doubts arisen during the lectures or the resolutions of problems etc.

Assessment			
Methodologies	**Competencies**	**Description**	**Qualification**
Guest lecture / keynote speech	A1 A2 A3 B1 B7 B10	The active participation of alumni will be encouraged. Some questions will be asked during the lectures in order to gauge the commitment of students and the acquisition of the subject learning aims	10
Case study	A1 A2 B2 B3 B7 B10 B11	In these classes, the active participation of the students will be assessed. Also, the more or less correct approach to the case solution will be marked. In some cases, tutorials might also be used to assess the adequate acquisition of the competencies.	15
Problem solving	A1 A2 B1 B2 B3 B7 B10 B11	The solution of problems and questions will be marked. The active participation of alumni will also be assessed. In some cases, tutorials might also be used to assess the adequate acquisition of the competencies.	15
Mixed objective/subjective test	A1 A2 A3 B3 B7	The mixed text will be marked in order to assess the adequate acquisition of the subject competencies. The assessment criteria will be known before the exam.	60

Assessment comments
The assessment of ?Metal Complexes? consists of two major contributions: the continuous assessment process and a final exam (mixed text). Attendance to the final exam requires the previous attendance to, at least, the 80% of the compulsory attendance classes (problem solving, case study classes and tutorials) The continuous assessment (N1) has a contribution of 40% to the final marks of the subject and it is the sum of marks corresponding to the interactive classes in small groups: seminars (problem-solving, case study classes) and tutorials. The following activities sum for the final mark problem-solving, case studies (15%), essays and reports (5%), oral exam [(problem solving + case studies), 10%] questions during the course (10%). If oral exam and essays are not given, the contribution of seminars (problem-solving plus case studies) will be a 30%. In the final exam (mixed test, N2) students will be examined of the whole of the subject contents. The final mark is the sum of: Final mark= (0.4 x N1 + 0.6 x N2) N1 = mark corresponding to continuous assessment (0 to 10) N2 = mixed test mark (0-10) Those students who fail the subject must repeat all the activities and exams.

Sources of information

Basic	- J. Rivas Gispert (2008). Coordination Chemistry. Weinheim: Willey-VCH - 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 - J. Rivas Gispert (2000). Química de la 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. McGraw-Hill Interamericana
Complementary	

Recommendations
Subjects that it is recommended to have taken before
Profundización en Química Inorgánica/610509003
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
Other comments
The student must know the basic principles of coordination chemistry as, for example, the definition of coordination compound and its components, as well as the bonding theories used to describe this type of compoundsRecommendations for the studyIs highly advisable the attendance to all the lectures. Daily study is essential to pass the subject. The resolution of the problems is key to study the subject.