



## IDENTIFYING DATA

### Inorganic Chemistry III: Coordination Chemistry

Subject	Inorganic Chemistry III: Coordination Chemistry			
Code	V11G201V01304			
Study programme	Grado en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3rd	1st
Teaching language	#EnglishFriendly Galician			
Department				
Coordinator	Vázquez López, Ezequiel Manuel			
Lecturers	Couce Fortúnez, María Delfina García Fontán, María Soledad Vázquez López, Ezequiel Manuel			
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General description	<p>This subject addresses the most relevant aspects of Coordination Chemistry: This type of compound will be studied from the structural, synthetic point of view and also its most outstanding properties.</p> <p>English Friendly subject: International students may request from the teachers:</p> <p>a) materials and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.</p>			

## Training and Learning Results

Code	
A2	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
A3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
B1	Ability for autonomous learning
B3	Ability to manage information
B4	Ability for analysis and synthesis
C7	Distinguish the main types of chemical reactions and their characteristics
C15	Know the main techniques of structural research, including spectroscopy
C26	Perform correctly usual procedures in the laboratory, including the use of standard chemical instrumentation for synthetic and analytical work
D2	Capacity for teamwork

## Expected results from this subject

Expected results from this subject	Training and Learning Results		
Define the global and steps thermodynamic stabilities constants and describe the chelated, macrocyclic and crypto effects.	C7		
Classify the ligands and the compounds of coordination, as well as recognize the presence of isomerism.	A2	B3	C15
Deduce the spectroscopic term for the electronic configuration of a metal in a coordination compound.	A5	C15	
Construct and interpret a qualitative diagram of energies from molecular orbitals to octahedral complexes.	A5	B1	

Interpret the electronic spectra of the octahedral and tetrahedral complexes of transition metals and rationalize their magnetic behavior.	B3	C15
	B4	
Describe the different types of substitution mechanisms and rationalize the different products obtained in substitution reactions of octahedral and plane-square complexes.	B3	C7
Rationalize the thermodynamic stability of coordination compounds as a function of the oxidation state of the metal and the type of ligand.	A3	B3 C7
Be that to carry out in the laboratory to preparation of any composed of coordination as well as to realize his structural determination		C26 D2
Describe the mechanisms of internal sphere and external sphere in the processes of electronic transfer in complexes.		C7

## Contents

Topic	
Types of ligands.	Denticity of the ligands Functionality of the ligands
The coordination polyhedron	Number of coordination Geometry of coordination *Isomeria. Nomenclature and indexes of coordination
The bond in coordination compounds(I)	Introduction to crystal field theory Octahedral complexes of weak field and strong field. Tetrahedral and Square-plane complexes
Thermodynamic properties of the coordination compounds	Stability constants and factors that affect them Chelate, macrocycle and criptate effects Irvin-Williams series Approximation of Pearson
The bond in coordination compounds(II)	Molecular orbital theory in octahedral complexes Metal-Ligand Interaction
Spectroscopic and magnetic properties of complex.	Energetic states. Rules of selection. General characteristics of the electronic spectra. Magnetic behaviour
Reaction mechanism in coordination compounds.	Substitution reactions in square-plane and octahedral complexes. Electronic transfer processes.
Practices of laboratory	Synthesis of transition metal coordination compounds. Characterization by means of different spectroscopic techniques Study of properties and catalysis applications

## Planning

	Class hours	Hours outside the classroom	Total hours
Seminars	24	36	60
Laboratory practical	14	14	28
Lecturing	24	24	48
Objective questions exam	2	0	2
Report of practices, practicum and external practices	0	12	12
Objective questions exam	0	0	0

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

## Methodologies

	Description
Seminars	The seminar classes will be dedicated to the resolution of practical cases related with the subject as well as to the resolution of doubts or questions that arose in the development of each subject. It is also contemplated to carry out seminars in which aspects not taught in previous subjects but necessary for the course of the course will be addressed.
Laboratory practical	The laboratory practices will consist of 4 sessions of 3.5 hours attendance. The students will carry out different experiences in the laboratory and must make the corresponding laboratory book. Some of the experiences may require the previous study individually or by group.
Lecturing	In the theoretical kinds will present the fundamental aspects of the subjects

## Personalized assistance

Methodologies	Description
Seminars	During all the teaching period them/the students will be able to consult all type of doubts of the subject in schedule of tutorships or previous appointment.

Laboratory practical	The students will be able to consult to professors all type of doubts of the work in the practices of laboratory
Lecturing	During all the teaching period them/the students will be able to consult all type of doubts of the subject in schedule of tutorships or previous appointment.

### Assessment

	Description	Qualification	Training and Learning Results
Seminars	In the seminar sessions, students may be asked to solve simple questions that they must deliver at that time and that will serve for their evaluation. The score will only be taken into account if the score obtained in the global test is equal to or greater than 3 points out of 10.	15	C7 C15
Laboratory practical	The evaluation in the laboratory practices will have 10% regarding the laboratory notebook (it can be through a written test) and 5% to the behavior and skills by direct observation of the teacher. Students may also be asked to solve simple questions that they must deliver at that time and that will serve for their evaluation.	15	A2 A3 C26 D2
Lecturing	In the lecturing sessions, Students may also be asked to solve simple questions that they must deliver at that time and that will serve for their evaluation. The score will only be taken into account if the score obtained in the global test is equal to or greater than 3 points out of 10.	5	A3 B3 C7 B4 C15
Objective questions exam	There will be two short tests (1 hour) where the skills acquired at the time will be evaluated. The date and time of completion will appear in the academic schedule approved by the corresponding Faculty Board.	30	C7 C15
Objective questions exam	There will be a final test in which an overall evaluation of the subject will be made. The date and time of completion will appear in the academic schedule approved by the corresponding Faculty Board.	35	C7 C15 C26

### Other comments on the Evaluation

Conditions that affect **any type of evaluation**:

- All written tests will include a set of questions on nomenclature and formulating simple inorganic compounds. If you do not achieve 90% of correct answers, the qualification of the corresponding test will not be considered in the corresponding evaluation.
- You can be requested, in person, from the student, the clarifications he deems appropriate regarding his/her answers in any of the written tests. Your answers may be considered in the evaluation of the test and modify its qualification.
- Laboratory practices are of an experimental nature and compulsory attendance at all sessions (Article 14 of the Regulation on Evaluation, Qualification and Quality of Teaching and the Student Learning Process of the University of Vigo). The evaluation of experimental skills will be carried out in the compulsory attendance sessions.
- The final grade of the students, if it is higher than 7 points out of 10, may be normalized so that the highest grade can be up to 10 points.

Conditions to qualify for **continuous evaluation**:

- Attendance at theoretical classes and seminars (Article 13 Evaluation regulation) and laboratory practices is mandatory
- The teacher must have a minimum of 80% of the deliverables proposed in the different face-to-face activities (exercises in theoretical classes and seminars or autonomous work exercises) in time and form at the end of the course.
- It is also mandatory for the student to take all the written tests planned to pass the subject.
- Failure to comply with any of these conditions implies the loss of the right to continuous evaluation.

**Development of continuous evaluation:**

- The specific competences of the subject related to the competences of the degree (CE7, CE15 and CE26) will be explicitly evaluated in exercises in the classroom and written tests. The basic, general and transversal competences will be evaluated implicitly in the qualification of the exercises.
- A score greater than or equal to 30% of the total value will be required in each of the written tests (short and final) and in the total sum of the grades of the deliverables, as well as 50% of the laboratory practices, so that the final

grade has taking into account the rest of the evaluation elements (deliverables and short tests).

- In the case of not achieving any of the minimums, the report will include the weighted result of the tests and qualified exercises in which the criterion was achieved.
- Students who do not pass the subject at the end of the semester must take a written test in the closing period of the final evaluation in July. This test will have a value of 35% of the grade and will replace the results of the test at the end of the semester.
- The qualification of the deliverables (of the classroom activities) and short tests are not recoverable.

### Global assessment

1) For non-compliance with the conditions for continuous evaluation If the conditions for continuous assessment are not met, the student may take a test at the end of the semester where he/she must solve questions related to all the specific skills of the subject. If you have passed the CE26 competency (relating to laboratory practices) in the same course, this will be considered passed. 2) Within the period determined by the Faculty of Chemistry, the student may request the overall assessment.

### Respect for the final test:

It will be written and in each question, the learning outcome competence that is being evaluated will be identified. In that case:

- It will be necessary to obtain a minimum of 3 points out of 10 on average in the evaluation in those related to the CE7 and CE15 skills and 5 in those related to the CE26 skill (laboratory work skills) to pass the subject
- It will be necessary to obtain an overall grade equal to or higher than 5 out of 10 in that test to pass the subject and, in no case will the previous grades obtained during the semester be taken into account
- This test will be different in extension to the one carried out by those who opt for continuous evaluation, although it will be carried out on the same date.

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### Sources of information

#### Basic Bibliography

Bhatt, Vasishtha, **Essentials of coordination chemistry [Recurso de Internet] : a simplified approach with 3D visuals**, Elsevier : Academic Press, 2016

Catherine E. Housecroft, Alan G. Sharpe ; traducción Pilar Gil Ruiz,, **Química inorgánica**, 2ª, Pearson Prentice Hall, 2006

Catherine E. Housecroft, Alan G. Sharpe, **Inorganic Chemistry**, 5ª, Harlow: Pearson Education, 2018

#### Complementary Bibliography

Ribas Gispert, Joan, **Coordination chemistry**, Wiley-VCH, 2008

Winter, Mark J., **D-block chemistry**, 2ª, Oxford University Press, 2015

Huheey, James E., **Inorganic chemistry : principles of structure and reactivity**, 4ª, New York : Harper Collins, 1993

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### Recommendations

#### Subjects that continue the syllabus

Inorganic Chemistry IV: Transition Metals and Solid State/V11G201V01309

#### Subjects that are recommended to be taken simultaneously

Physical Chemistry III: Quantum Chemistry/V11G201V01303

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

Inorganic chemistry I/V11G201V01204

Inorganic chemistry II/V11G201V01209