



## IDENTIFYING DATA

### Inorganic chemistry II

Subject	Inorganic chemistry II			
Code	V11G200V01604			
Study programme	(*)Grao en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3rd	2nd
Teaching language	Spanish Galician			
Department				
Coordinator	Castro Fojo, Jesús Antonio			
Lecturers	Castro Fojo, Jesús Antonio García Fontán, María Soledad			
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General description	This matter presents the most relevant aspects of the Chemistry of the Transition Metals as well as an important class of derivatives known as coordination compounds.			

## Competencies

Code	
C2	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: types of chemical reactions and its main characteristics
C7	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: kinetics of change, including catalysis and reaction mechanisms
C8	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: main techniques for structural determination, including spectroscopy
C9	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: characteristic properties of the elements and their compounds, including group relationships and variations in the periodic table
C12	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: structural features of chemical elements and their compounds, including stereochemistry
C14	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: relationship between macroscopic properties and properties of individual atoms and molecules, including macromolecules

## Learning outcomes

Expected results from this subject	Training and Learning Results
Classify ligands and coordination compounds, as well as recognize the presence of isomers.	C12
Define the global and steps thermodynamic stability constants of one complex and describe the chelate, macrocyclic and cryptate effects	C2 C14
Deduce the spectroscopic terms for stable electronic configurations of the transition metals in a coordination compound	C9
Construct and interpret a qualitative energy diagram of molecular orbitals in octahedral complexes	C12 C14
Interpret the electronic spectra of octahedral, tetrahedral and square planar complexes of transition metals and rationalize their magnetic behavior	C8 C14 C7
Describe the different mechanisms of substitution and rationalize the various products obtained in substitution reactions in octahedral and square planar complex.	
Describe how you can get metals from their natural resources	C9
Being able to differentiate the behavior between the elements of the first transition series and the second and third.	C9
Predicting the reactivity of the metal oxides, halides and of those of the coordination compounds based on the bond and on the oxidation state of the metal.	C9

Rationalize the thermodynamic stability of coordination compounds, depending on the oxidation state of the metal and the type of ligand.

C9

C12

C14

## Contents

Topic	
Subject 1: Introduction to the Chemistry of the transition metals.	Physical properties. Electronic configuration. Multielectrons Systems. Microstates and spectroscopic terms. Reactivity and characteristic properties. General methods of obtention and purification of metals
Subject 2: Coordination Chemistry.	Numbers and geometry of coordination. Ligand types. Isomerism in metal complexes. Nomenclature.
Subject 3: Bond in coordination compounds (I): Crystal field theory	Theory of crystal field. Complexes of weak and strong field. Tetrahedral and square-plane complexes.
Subject 4: Bond in coordination compounds (II).	Molecular orbital theory in octahedral complexes. Metal-ligand interaction.
Subject 5: Spectroscopic and magnetic properties of the complexes.	Energetic states. Rules of selection. General characteristics of the electronic spectra. Magnetic behavior
Subject 6: Thermodynamic properties of the coordination compounds.	Stability constants and affecting factors them. Chelate, macrocycle and crystate effects.
Subject 7: Reaction mechanisms in coordination compounds.	Reactions of substitution in octahedral and square-plane complexes. Processes of electronic transfer
Subject 8: Chemistry of the group 3 and 4 metals.	Obtention methods and uses. Usual oxidation numbers. Representative compounds of titanium: halides, oxides and mixed oxides. Coordination compounds.
Subject 9: Chemistry of the group 5 metals.	Obtention methods and uses. Usual oxidation numbers. Representative compounds of vanadium: halides, oxides and mixed oxides. Coordination compounds.
Subject 10: Chemistry of the group 6 metals.	Production methods and uses. Usual oxidation numbers. Representative compounds of chromium: halides, oxides and oxoanions. Coordination compounds.
Subject 11: Chemistry of the group 7 metals.	Production methods and uses. Usual oxidation numbers. Representative compounds of manganese: halides, oxides and oxoanions. Coordination compounds. Bioinorganic chemistry of manganese and technetium.
Subject 12: Chemistry of the group 8 metals.	Production methods and uses. Usual oxidation numbers. Representative compounds of iron: halides, oxides and oxoanions. Coordination compounds. Bioinorganic chemistry of iron.
Subject 13: Chemistry of the group 9 metals.	Production methods and uses. Usual oxidation numbers. Representative compounds of cobalt: halides, oxides and oxoanions. Coordination compounds. Bioinorganic chemistry of cobalt.
Subject 14: Chemistry of the group 10 metals.	Production methods and uses. Usual oxidation numbers. Representative compounds of nickel: halides, oxides and oxoanions. Coordination compounds. Bioinorganic chemistry of platinum.
Subject 15: Chemistry of the group 11 metals. .	Production methods and uses. Usual oxidation numbers. Representative compounds of copper: halides, oxides and oxoanions. Coordination compounds. Bioinorganic chemistry of copper and gold.

Subject 16: Chemistry of the group 12 metals. Production methods and uses.  
Usual oxidation numbers.  
Representative compounds of zinc and mercury: halides, oxides and oxoanions.  
Coordination compounds. Bioinorganic chemistry of the elements of the group.

## Planning

	Class hours	Hours outside the classroom	Total hours
Seminars	26	26	52
Lecturing	26	39	65
Objective questions exam	2	2	4
Problem and/or exercise solving	0	21	21
Essay questions exam	4	4	8

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

## Methodologies

	Description
Seminars	Seminar classes will be devoted to the resolution of case studies related to the subject as well as the resolution of questions or issues that arise in the development of each topic. Beheld also hold seminars that address issues not taught in other courses but necessary for the progress of the course.
Lecturing	The lectures will be devoted to presenting the fundamental aspects.

## Personalized assistance

Methodologies	Description
Lecturing	Throughout the educational period students can consult any doubts on the matter tutorials or previous appointment.
Seminars	Throughout the educational period students can consult any doubts on the matter tutorials or previous appointment.

## Assessment

	Description	Qualification	Training and Learning Results
Seminars	In the lectures they may ask students to solve simple issues that will have to deliver at that time and will serve for the evaluation. The score will be considered only if the test is long reaches a score of 3 or above on 10 points.	15	C2 C7 C8 C12 C14
Objective questions exam	There will be two short tests throughout the school period of 1-2 hours each. The score will be considered only if the test is long reaches a score greater than or equal to 3 points out of 10.	30	C2 C7 C8 C9 C12 C14
Problem and/or exercise solving	Throughout the course they ask students to do exercises to perform such work. The solutions must be submitted in a timely manner previously established. It is possible that the teacher ask the student to defend his response delivered before proceeding with the assessment. The score will be considered only if the test is long reaches a score greater than or equal to 3 points out of 10.	15	C2 C7 C8 C9 C12 C14
Essay questions exam	There will be a test at the end of the semester in which students must resolve all issues related to the presented contents.	40	C2 C7 C8 C9 C12 C14

## Other comments on the Evaluation

Conditions to opt the continuous evaluation:

- Attendance at lectures and seminars is mandatory. The student has to mandatorily assist it all the class and seminars.
- To pass the course the professor must have time and form of a minimum of 80% of the exercises proposed in the various activities and presences. It is also mandatory for the student to present all written tests planned to pass the course.
- The no fulfillment of the conditions involves the loss of the right to the continuous evaluation

Development of continuous evaluation:

- The competencies of the subject relating to the competencies of the degree (A1-A3, A5, A10, A12 and A20) will be assessed explicitly in classroom exercises and written tests. The transferable skills will be evaluated implicitly by the qualification of the exercises (B2, B3 and B4).

- Will need a score greater than or equal to 30% of the total value in each of written tests (short and final) and the sum total of the qualifications of the deliverables to the final qualification note the rest of the elements of evaluation (exercises and short tests). Failure to achieve any of the minimum, in the act appear the result of the tests and weighted exercises in which qualified reached criterion.

- Students who fail the course at the end of the semester will take a written test in the closing period of evaluation in the final month of July. This test will be worth 40% of the mark and replace the test results at the end of the semester. The qualification of the exercises (classroom activities) and short tests are not recoverable.

In the case of not achieving the conditions for continuous evaluation, it/the student will be able to presented the a proof at the end of the semester where will owe to resolve questions related with all the specific skills of the subject. In each question or question, the kind of skill being evaluated will be identify. This proof will be different in extension to the realized by those that opt by continuous evaluation. In this case:

- 1.- It will be necessary to obtain a minimum of 3 points on 10 of average in the evaluation of each specific competition to surpass the subject.
- 2.- It will be necessary to obtain an equal global qualification or upper to 5 on 10 in this proof to surpass the subject and, in any case previous qualifications obtained during the semester will be not considered.
- 3.- The qualification will not be affected by the normalization applied to be upper to 7 points.

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## Sources of information

### Basic Bibliography

### Complementary Bibliography

Housecroft, C.E. e Sharpe, A.G., **Inorganic chemistry**, 3<sup>o</sup> Ed.,

Winter, Mark J., **D-block chemistry**, Oxford : Oxford University Press,, 1994

Housecroft, Catherine E., **The Heavier d-block metals : aspects of inorganic and coordination chemistry**, Oxford : Oxford University Press,, 1999

Atkins, Peter, **Inorganic Chemistry**, Oxford : Oxford University Press,, 2010

Housecroft, C.E. e Sharpe, A. G., **Inorganic chemistry**, 4<sup>o</sup> ed.,

Ribas Gispert, J., **Coordination Chemistry**, Willey-VCH, Weinheim, 2008

Rodgers, G.E., **Introduction to Coordination, Solid State and Descriptive Inorganic**, 3<sup>a</sup> Ed., Chemistry. BrooksCole Cengage Learning: Bel, 2012

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## Recommendations

### Subjects that continue the syllabus

Materials chemistry/V11G200V01702

Inorganic chemistry III/V11G200V01703

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## Contingency plan

### Description

=== EXCEPTIONAL MEASURES SCHEDULED ===

In front of it uncertain and unpredictable evolution of the sanitary alert caused by the COVID- 19, the University establishes join extraordinary planning that will actuate in the moment in that the administrations and the @propio institution determine it attending to criteria of security, health and responsibility, and guaranteeing the classroom teaching and non-classroom teaching when aplicate. These already scheduled measures guarantee, in the moment that was prescriptive, the development of the classroom teaching and non-classroom teaching when being known beforehand (or with a wide advance)

pole students and the teaching staff through the tool normalized and institutionalized of the teaching guides DOCNE\*T.

#### === ADAPTATION OF The METHODOLOGIES ===

To teaching activity will impart by means of Remote Campus and will also foresee the use of the platform "Faitic" how reinforcement and without prejudice of other measures that can adopt to guarantee the accessibility of the students and teachers to it.

- Teaching methodologies that keep :

Depending of the situation, would keep the classroom seminars and of not being possible, will keep in a virtual format

- teaching Methodologies that modify

In the case that classroom teaching were not possible, non-classroom teaching would be used.

The ttention to the students requested can be carried out by mail electronic or in virtual dispatches.

- Modifications ( proceed) of the contained to impart

None

- additional Bibliography to facilitate to car-learning

Will put the disposal of the students, to be accurate, manual built ad hoc

#### === ADAPTATION OF The EVALUATION ===

To evaluation will keep the same in normal periods and in exceptional periods. The platforms of teaching allow the evaluation such and how is posed.

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