



**UCAM**  
UNIVERSIDAD  
CATÓLICA DE MURCIA

# Course Guide 2019/2020

## Inorganic Chemistry

Mode: On Campus

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## Inorganic chemistry

Module: **Chemistry**

Subject: **Inorganic chemistry**

Level: **Basic**

No of credits: **6 ECTS.**

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Office hours: **Tuesday de 10:00 a 12:00h**

Professor coordinating the Module: **Lucia Guardiola Garcia**

Academic Season: **1<sup>st</sup> Course – 2<sup>st</sup> Semester.**

## Brief Description

Students in this subject should acquire basic knowledge of general inorganic chemistry necessary for their professional future. It also addressed the foundation for better understanding of other matters related to degree. These basic skills enable homogenize the knowledge level of students in the face of continuing with specific areas of the degree. In its development the student acquires the capacity for analysis and reasoning, become familiar with the new teaching methodology in addition to acquiring specific knowledge and skills in this field.

A professional degree in Pharmacy must be in possession of a non-negligible chemical knowledge needed to understand chemical and biochemical processes underlying the synthesis, metabolism and analysis of active principles that are part of the pharmaceutical formulations.

## Prerequisites

None

## Objetives

1. Acquire the basic knowledge of Organic and Inorganic Chemistry.
2. Integrate the necessary chemical bases for future professional development.
3. Understand the problems related to the transformation of chemical substances.
4. Know the acid-base, redox, complex formation and precipitation processes that take place in solution.
5. Perform the necessary calculations for the correct evaluation of the equilibria in solution.

## Competences and Learning Outcomes

### Basic competences

MECES1.- That students demonstrate to understand knowledge in an area of study that starts from the base of general secondary education, and is usually found at a level that, although supported by advanced textbooks, also includes some aspects that imply knowledge coming from the vanguard of its field of study.

MECES2.- That students know how to apply their knowledge to their work in a professional way and have the skills that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study.

MECES3.- That students have the ability to gather and interpret relevant data in order to make judgments that include a reflection on relevant social, scientific or ethical issues.

MECES4.- That students transmit information, ideas, problems and solutions to a specialized and non-specialized public

MECES5.- That students develop those learning skills necessary to undertake further studies with a high degree of autonomy.

### General Competences

(CG1).- Identify, design, obtain, analyze, control and produce drugs and medicines, as well as other products and raw materials of sanitary interest for human or veterinary use.

(CG10).- Design, apply and evaluate reagents, methods and clinical analytical techniques, knowing the basic fundamentals of clinical analysis and the characteristics and contents of laboratory diagnosis reports.

(CG11).- Evaluate the toxicological effects of substances and design and apply the corresponding tests and analyzes

(CG13).- To develop communication and information skills, both oral and written, to deal with patients and users related to their professional activity. To promote the capacities of work and collaboration in multidisciplinary teams and those related to other health professionals.

(CG15). - To recognize limitations and the need to maintain and update professional competence, paying special attention to the self-learning of new knowledge based on scientific evidence.

**Interdisciplinary competences**

CT1.- Prepare and write scientific reports.

CT2.- Demonstrate critical and self-critical reasoning.

CT4.- Incorporate into their behavior the ethical principles that govern research and professional practice.

CT5.- Acquire awareness of the risks and environmental problems associated with their professional practice

CT7.- Reading and listening comprehension, oral and written production that allows him to develop in a professional context in English. Interpretation of texts in technical and scientific English in the field of research. Communicate in Spanish and English using the usual audiovisual media.

CT8.- Defend personal points of view based on scientific knowledge.

CT9.- Integrate knowledge and apply it to solve problems using the scientific method.

CT10.- Acquire capacity for organization, planning and execution.

CT11.- Development of autonomous or team work capacity in response to the specific needs of each situation.

CT13.- Progress in his ability to work in multidisciplinary groups.

CT15.- Acquire capacity for decision making and management of human resources

**Specific Competences**

(CEM1.7). Know and understand the characteristic properties of the elements and their compounds, as well as their application in the pharmaceutical field.

**Methodology**

Methodology	Hours	Hours of classroom work	Hours of Non-Classroom Work
Classroom based Classes	18	60 (40 %)	
Seminars	12		
Academic Tutorials	6		
Classroom Evaluations	6		
Laboratory practices	18		

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Personal Study	63		90 (60%)
On-line Tutorials	9		
Resolution of Exercises and Practical Cases	9		
Project Completion and Oral Presentations	9		
<b>TOTAL</b>	<b>150</b>	<b>60</b>	<b>90</b>

## Syllabus

### Theoretical program

**Classes in the classroom** (18 hours): Exhibition of contents by the teacher, analysis of skills, explanation and demonstration of skills, abilities and knowledge in the classroom or through audiovisual media. The presentations will be available to the students in the virtual campus on the date prior to the exhibition in class.

**Tutorías académicas** (6 hours): Individualized tutorials and small groups will be held to clarify doubts or problems raised in the learning process, direct work, review and discuss the materials and topics presented in the classes, guide students about the work, practical cases and readings to be made, consolidate knowledge, check the evolution of student learning, and provide feedback on the results of that process, using different IT tools such as forums, chats, or self-assessments.

**Laboratory practices** (18 hours): The nature of the degree and the competences associated with it make the development of laboratory practices and face-to-face sessions indispensable. These will be developed and distributed and organized in the form of practical workshops throughout the academic year.

**Seminaries** (12 hours): Four bioinorganic chemistry seminars will be held where the students will have to make presentations of works about the proposed topics (8hrs) The type problems of the collection of problems proposed students will be solved along the semester (2hrs).

**Classroom assessment** (6 hours): All the necessary activities will be carried out to evaluate the students through the learning results in which the competences acquired by the student in each subject are specified, encouraging if it is appropriate the self-assessment and group co-evaluation exercises. In these evaluations, the examination itself, the practices and the work carried out will be taken into account.

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**Personal study** (63 horas): Its purpose is to assimilate the contents and competences presented in the classes and to prepare possible doubts to be solved in the tutorials, realization of learning activities and preparation of exams.

**Resolution of exercises and case studies** (9 horas). It consists in the resolution by students of problems and / or practical cases. All this will serve, to achieve a significant learning of the knowledge derived from the content of the subject.

**Realization of works** (9 horas). Realization of practical and / or theoretical works proposed by the responsible teacher individually or in a group.

**On-line Tutorials** (9 horas): Use of the virtual classroom to favor the contact of the students with the subject through the forum, outside the classroom, as well as facilitate their access to selected information and useful for their work not present.

## Temario

### Programa de la enseñanza teórica

Topic 1. Hydrogen. Hydrides

Topic 2. Noble gases

Topic 3. Study of relevance metals of blocks

Topic 4. Most important elements and compounds of the p block (groups 17 to 13)

Topic 5. Study of relevance metals of blocks s and d. Coordination compounds. Nomenclature. Ligands Link.

Unit 6. Complex formation equilibria. General considerations.- Types of ligands.- Complex formation constants.- Chelate complexes.- Ion masking.- Stability of the complexes as a function of the pH.- Areas of predominance of the different species.- Graphical representations.

Topic 7 Precipitation reactions. Precipitation reactions.- Solubility and Product of solubility.- Separations by precipitation.- Properties of precipitates.- Precipitation in homogeneous media.- Thermal behavior of precipitates.- Solubility as a function of pH.- Solubility of precipitates by formation of complexes

Topic 8 Oxidation-reduction equilibria. Oxidation - reduction balances.- Review of fundamental concepts.- Redox systems of water.- Dismutation.- Formal potentials.- Variation of the potential of a system as a function of pH.- Influence of the formation of complexes and precipitates on the potential of a system. Fundamentals of electroanalytical chemistry.

Tema 1. Hidrógeno. Hidruros  
Tema 2. Gases nobles

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### Practical teaching program

#### Seminarios

- Seminar 1. Bioinorganic chemistry of some of the most relevant elements, Fe, Cu, Zn.  
Seminar 2. Bioinorganic chemistry of some of the most relevant elements, Co, Mo, Cr  
Seminar 3. Bioinorganic chemistry of some of the most important non-metallic elements  
Seminar 4. Bioinorganic compounds with pharmacological activity.  
Seminar 5. Complexity and precipitation equilibria.  
Seminar 6. Redox balances.

#### Prácticas laboratorio

- Practice 1.- Lead chemistry.  
Practice 2.- Manganese chemistry.  
Practice 3.- Chromium chemistry.  
Practice 4.- Precipitation of nickel hydroxide. Preparation of Ni (II) complexes. a) Preparation of  $[\text{Ni}(\text{NH}_3)_6] \text{Cl}_2$ . b) Preparation of  $[\text{Ni}(\text{en})_2] \text{Cl}_2 \cdot \text{H}_2\text{O}$ .  
Practice 5.- Preparation of copper sulphate pentahydrate and copper sulfate and ammonium  
Practice 6.- Preparation of potassium chromate (III) trioxalate.  
Practice 7. Complex formation equilibria.  
Practice 8. Precipitation equilibrium  
Practice 9. Balances redox balances.

## Relationship to Other Courses of the Study Plan

The subject of Q. Inorganic is mainly related to the following subjects of the curriculum: Analytical techniques, Introduction to work in the laboratory, Pharmaceutical Chemistry I and II, Physico-chemistry, General Chemistry, Q. Organic I and II.

## Grading System

### June/September Sessions

- **Practical tests and seminars:** (60%). Students must pass the practices to pass the course. Practices will be assessed through a deliverable that will be developed the same day of the practice. The seminars will be evaluated through a test type test or through the resolution of exercises or practical cases and that will average with the theoretical tests



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- **Theoretical tests:** (40% del total de la nota.). Tests (or evaluative tests) will be carried out with theoretical-practical questions type test, resolution of exercises or practical cases

The student shall pass the subject when the weighted average is equal to or greater than 5 points and all the parts that make up the grading system have been passed, with an overall weight equal to or greater than 20%.

If the student has less than 5 in any of the parts with a weight equal to or greater than 20%, the subject will be suspended, and the student must retake the part(s) in the next session within the same academic year. The suspended part(s) in official sessions (February/June) will be saved for successive sessions that are held in the same academic year.

In the event that the subject is not passed in the September session, the passed parts will not count for successive academic years.

The grading system (RD 1.125/2003. of September 5) shall be the following:

- 0-4.9 Suspended
- 5.0-6.9 Passed
- 7.0-8.9 Excellent
- 9.0-10 Outstanding (SB)

Honorable mention may be granted to students who have earned a grade equal to or greater than 9.0. This number may not exceed 5% of the total number of students enrolled in a subject in the corresponding academic year, unless the number of students enrolled is less than 20, in which case only a single honorable mention may be granted.

## Bibliography and Reference Sources

### Basic Bibliography

- Petrucci, R.H. (2008). Química General. Madrid: Prentice Hall.
- Chang, R. (2010) Química. México: McGraw-Hill.
- Sharpe. A.G.Sharpe. 1991. Editorial Reverté.

### Additional Bibliography.

## Related websites

[www.modelscience.com/PeriodicTableSp.html](http://www.modelscience.com/PeriodicTableSp.html). *Programas de química*

[www.monografias.com/trabajos11/nomecom/nomecom.shtm](http://www.monografias.com/trabajos11/nomecom/nomecom.shtm). *Nomenclatura de compuestos*

<http://www.librosite.net/data/glosarios/petrucci/videos/contenidos.htm>. *Animaciones de química*

<http://phet.colorado.edu/en/simulations/translated/es>. *Simulaciones químicas de la Universidad de Colorado*

<http://www.quimicaweb.net/>. *Temas de química*

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<http://www.rseq.org/>. *Real Sociedad Española de Química*

<http://ees.elsevier.com/aca/>*Analytica Chimica Acta*

<http://pubs.acs.org/journal/ancham?cookieSet=1>*Analytical Chemistry*

## Study recommendations

Daily continuous study of the subject.

## Teaching materials

General:

- PDF document of Presentation of the subject.

Theoretical Part:

- PDF documents related to each subject of the subject

Practical part:

- Lab coat, scientific calculator.
- PDF document with the Laboratory Practices Manual.
- PDF documents with the exercises of each subject of the subject
- PDF documents with solved exercises of each subject of the subject
- Computer software: Explorer, Microsoft Word, Power Point, Adobe Reader, Excel, Geogebra, chemaxon.

## Tutorials

The academic tutoring will have among its objectives to guide students on the contents of the subject, study methods and evaluation system. The doubts about the taught subject will be solved and basic concepts will be reinforced for an adequate follow-up of the syllabus, in those students that require it. In addition, it will be advisable to read different articles and monographs to expand the knowledge of the subject.

The University also has a Special Body of Tutors that conducts personal tutoring with the students enrolled in the degree. The personal tutor accompanies the students throughout the university stage. You can check the following link:

<https://www.ucam.edu/servicios/tutorias>