# COURSE DATA

## DATA SUBJECT

**Code:** 34061
**Name:** Inorganic Chemistry
**Cycle:** Undergraduate Studies
**ECTS Credits:** 4.5
**Academic year:** 2025-26

## STUDY (S)

| Degree | Center | Acad. year | Period |
|---|---|---|---|
| 1201 - Degree in Pharmacy | Facultat de Farmàcia i Ciències de L'alimentació | 1 | Second quarter |
| 1201 - Degree in Pharmacy | Facultat de Farmàcia i Ciències de L'alimentació | 1 | Second quarter |
| 1211 - Double Degree in Pharmacy and Human Nutrition and Dietetics | Facultat de Farmàcia i Ciències de L'alimentació | 1 | Second quarter |

## SUBJECT-MATTER

| Degree | Subject-matter | Character |
|---|---|---|
| 1201 - Degree in Pharmacy | Chemistry | BASIC |
| 1201 - Degree in Pharmacy | Chemistry | BASIC |
| 1211 - Double Degree in Pharmacy and Human Nutrition and Dietetics | Asignaturas obligatorias del PDG Farmacia-Nutrición Humana y Dietética | COMPULSORY |

## COORDINATION

FERRER LLUSAR SACRAMENTO

# SUMMARY

Inorganic Chemistry is a mandatory course which is offered during the second semester of the first year of the degree in pharmacy. In the current curriculum it consists of 4.5 ECTS. It is a subject intended to provide the student the fundamental concepts of chemistry applied to the chemical elements and their compounds. The student must achieve solid foundations to interpret and build up the potential applications and uses of inorganic compounds, not only to undertake the study of other subjects having a high chemical content, but also the study in other areas of the performance of the professional activities, either in research, teaching, pharmacy offices or industries.

Inorganic chemistry characterises by its great diversity and interdisciplinary nature. Its study covers the behaviour of more than 100 chemical elements, with thousands of compounds with very different properties, and this constitutes one of its most attractive features: the challenge of placing such a large

number of facts within a common set of ideas. A measure of its relevance is given by the fact that this discipline is beyond purely academic and is an important part of life as we know it; just think on the fact that enzymes, the catalysts of biological processes, are made up of coordination centers whose active site is regulated by metal ions. In addition, there are plenty of everyday inorganic compounds that facilitate our way of life (a simple antacid or toothpaste,for example).

The study of inorganic chemistry is based on the knowledge achieved during the General Chemistry course. From this knowledge, it will be undertaken the systematic study of a selection of elements of the representative groups ; in addition, the students will become familiar with the most important general principles applied to the chemistry of transition elements. They will also be provided with a general understanding of Bioinorganic Chemistry and pharmaceutical inorganic chemistry.

## PREVIOUS KNOWLEDGE

### RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

### OTHER REQUIREMENTS

## COMPETENCES / LEARNING OUTCOMES

### -

Act with autonomy in learning, making informed decisions in different contexts, issuing judgements based on experimentation and analysis, and transferring knowledge to new situations.

Apply such knowledge to the professional world, contributing to the development of human rights, democratic principles, principles of equality between women and men, solidarity, environmental protection and promotion of a culture of peace with a gender pe

Assign and determine the structure of the different types of inorganic compounds.

Collaborate effectively in work teams, assuming responsibilities and leadership roles and contributing to collective improvement and development.

Contribute to the design, development and implementation of solutions that respond to social demands, taking into account the Sustainable Development Goals as a reference.

Demonstrate critical and self-critical thinking in the field of the degree programme, considering aspects such as professional ethics, moral values and the social implications of the different activities carried out.

Develop skills to update knowledge and undertake further studies, including pharmaceutical specialisation, scientific research, technological development and teaching.

Explain phenomena and processes related to basic aspects of chemistry in an understandable manner.

Explain phenomena and processes related to inorganic chemistry in an understandable manner.

Gather and transmit information in English at a level of proficiency equivalent to B1 of the Council of Europe.

Know and understand, within the field of the degree programme, gender inequalities in society; integrate different needs and preferences based on sex and gender into the design of solutions and problem solving.

Know dissolution reactions, different states of matter and principles of thermodynamics and their application to pharmaceutical sciences.

Know how to communicate effectively, both orally and in writing, adapting to the characteristics of the situation and the audience.

Know how to interpret, evaluate and communicate relevant data in the different areas of pharmaceutical activity, using information and communication technologies.

Know how to solve simple quantitative problems related to chemical processes, both in terms of equilibrium and from a kinetic point of view.

Know the characteristic properties of elements and their compounds, and their application in the pharmaceutical field.

Module: Chemistry. Estimate the risks associated with the use of chemical substances and laboratory processes.

Name and formulate inorganic and organic chemical compounds.

Possess and understand knowledge in the different areas of study included in pharmacist training.

Propose creative and innovative solutions to complex situations or problems within the field of knowledge, to respond to diverse professional and social needs.

Search for and find knowledge related to the area, always applying critical and self-critical thinking.

Solve any basic problem relating to the determination of empirical and molecular formulas of compounds.

Transmit ideas, analyse problems and solve them with critical spirit, acquiring teamwork skills and assuming leadership when appropriate.

## DESCRIPTION OF CONTENTS

### 1. Hydrogen

Position in the Periodic Table,. natural occurrence: Isotopes. Physical and Chemical Properties. Reactivity. The hydrogen bond. Hydrides. Applications.

## 2. Halogens

General group properties. Natural occurrence and production. Physical and Chemical Properties. Halides. Oxoacids and oxo-salts. Applications. Biological aspects.

## 3. Group 16. General Group Properties and Oxygen

General Gropup Properties. Oxygen. Natural occurrence and production. Allotropy of molecular oxygen: dioxigen (singlet and triplet oxygen) and ozone. Oxides. Water. Hydrogen peroxide. Applications. Biological aspects.

## 4. Group 16: Sulfur

Natural occurrence and production. Allotropy of S. Chemical properties. Oxides, oxoacids and oxo-salts. Applications. Biological considerations.

## 5. Group 15: General group properties and Nitrogen

General group properties. Nitrogen. Natural occurrence and production.Physical and Chemical Properties. Molecular nitrogen. Ammonia. Oxides, oxoacids and oxo-salts. Applications. Biological considerations.

## 6. Group 15: Phosphorous

Natural occurrence and production. Allotropy. Chemical properties. Oxides, oxoacids and oxo-salts. Applications. Biological considerations.

## 7. Group 14: General Group Properties and Carbon

General group properties. Carbon. Natural occurrence and production. Allotropy. Chemical properties. Hydrides. Carbon-oxigen compounds. Cyanide. Applications. Biological considerations.

## 8. Group 14: Silicon

Natural occurrence and production. Comparative chemical study of C and Si. Physical and chemical properties. Silicon dioxide. Silicates. Applications. Biological considerations.

General group properties. Natural occurrence and production. Physical and chemical properties. Hydrides.

## 9. Group 13: Boron and Aluminun

Halides. Oxygen compounds. Applications. Biological considerations.

## 10. Alkaline Alkaline-earth elements

General characteristics of 1 and 2 groups. Natural occurrence and production. Physical and chemical properties. Chemistry in liquid ammonia of alkaline. Halides. Oxides and hydroxides. Applications. Biological considerations.

## 11. Introduction to transition elements. Coordination Chemistry

General Properties of transition elements. Oxidation states.
Coordination Compounds: geometry, bonding and nomenclature. Biological considerations.

## 12. Bioinorganic Chemistry

Introduction to Inorganic Biochemistry. Metal ion transport and storage. Oxygen transport and storage. Biological redox processes. Zn(II): natural Lewis acid.

# WORKLOAD

### PRESENCIAL ACTIVITIES

| Activity | Hours |
|---|---|
| Tutorials | 3,00 |
| Theory | 39,00 |
| Seminar | 3,00 |
| **Total hours** | **45,00** |

### NON PRESENCIAL ACTIVITIES

| Activity | Hours |
|---|---|
| Attendance at other activities | 0,00 |
| Individual or group project | 0,00 |
| Independent study and work | 7,00 |
| Preparation of lessons | 60,50 |
| Preparation for assessment activities | 0,00 |
| Resolution of case studies | 0,00 |
| **Total hours** | **67,50** |

# TEACHING METHODOLOGY

The course is structured around three major activities: theory lectures, seminars, and tutorials.

**Theory Lectures.** Lectures will be taught using tha blackboard and visual resources on a regular basis. Students should achieve the basic knowledge included in the agenda, by means of self study and class attendance. During the lectures, the professor will provide an overview of each topic, with special emphasis on those key concepts needed for the understanding of the subject matter, and will answer the questions and issues raised by the students. For the individual study and deep preparation of each subject, the professor will provide the students with the basic and complementary bibliography, appropriate internet links, as well as instructions and advice for the management of information resources.

**Seminars.** Practical seminars and monographic work-shops programmed to work out specific aspects of inorganic chemistry in order to reinforce the learning process. These activities will be carried out either individually or as a work group.

**Tutorials**. In the tutorials, doubts and questions raised during lectures will be clarified and the students will be advised about the most effective study method in order to improve their learning yield. In addition, the students will be provided with a list of questions to be solved out of the classroom. Tutorial attendance is mandatory.

## EVALUATION

The student's learning evaluation will take into account all the aspects described in the methodology section above, and this will be performed by the professor in a continuous assessment.

Ten percent of the final grade will represent the evaluation by the professor of student's class attendance, his reasoned and clear participation in class discussions; preparation and resolution of questions and problems, progress in the appropriate use of inorganic chemistry language; critical thinking and capacity for team work with the rest of the group. The mark corresponding to this continuous assessment will be kept for the 2nd call.

The students will take a final written exam which will entail a 90% on the final score. It will consist in conceptual or reasoning questions which will allow the student to demonstrate the degree learning of the fundamental concepts. The exam may also include a subject to be developed, in order to evaluate the student¿s capacity of synthesis and exposition. A minimum mark of 5.0 in the exam is mandatory.

The final grade will correspond to the weighted average value of these two marks. The total score should be 5.0 or higher for success.

## REFERENCES

- Introducción a la Química Bioinorgánica, Vallet, M., Faus, J., García-España, E., Moratal, J., Editorial Síntesis, Madrid, 2003.

- Química Inorgánica Descriptiva, G. Rayner-Canham, 2ª ed., Prentice Hall, 2000. En inglés, Prentice Hall, 2000; Descriptive Inorganic Chemistry, G. Rayner-Canham & T. Overton, 6th ed., Macmillan Learning, WH Freeman, 2017

- Química Inorgánica, P. Atkins, T. Overton, J. Rourke, M. Weller, F. Armstrong, 4ª ed. Mc- Graw Hill, 2008. En inglés, McGraw-Hill Interamericana, 2008; Shriver & Atkins Inorganic Chemistry, M. Weller; T. Overton, T.; J. Rourke and F. Armstrong, 6th ed., Oxford University Press, 2014.

- Química Inorgánica, C.E. Housecroft, A.G. Sharpe, 2ª ed., Prentice Hall, 2006. En inglés, Prentice Hall, 2006; Inorganic Chemistry, C. E. Housecroft & A. G. Sharpe, 5th ed., Pearson Education, 2018.

- Química Inorgánica, G. E. Rodgers, McGraw-Hill, 1995.