COURSE DATA

DATA SUBJECT

Code: 36452
Name: Inorganic Chemistry I
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1110 - Degree in Chemistry	Facultat de Química	2	First quarter
1929 - Double Degree Program in Physics and Chemistry	Facultat de Física	2	First quarter
1934 - Double Degree Program in Chemistry-Chemical Engineering	Facultat de Química	2	First quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1110 - Degree in Chemistry	Inorganic Chemistry	COMPULSORY
1929 - Double Degree Program in Physics and Chemistry	Segundo Curso (Obligatorio)	COMPULSORY
1934 - Double Degree Program in Chemistry-Chemical Engineering	Segundo curso	COMPULSORY

COORDINATION

GOMEZ GARCIA CARLOS JOSE

SUMMARY

One of the most complete definitions of Inorganic Chemistry is provided by T. Moeller, which defines this discipline as one that deals with the experimental research and theoretical interpretation of the properties and reactions of all the elements and all its compounds except for hydrocarbons and most of its derivatives. There are other definitions which, like the of J. E. Huheey, a priori may seem funny and/or lacking sense. This author, defines the Inorganic Chemistry as any area of the chemistry of interest for inorganic chemist. Although this definition apparently adds little to the understanding of the content of this discipline, is very interesting because today highlights the two most characteristic features of inorganic chemistry: (i) its great diversity and (ii) its interdisciplinary nature. Its study covers the behaviour of more than 100 elements, with thousands of compounds with very different properties, which is one of the most attractive characteristics: locate such a large number of facts in a similarly diverse. Its relevance gives an idea of this discipline goes beyond the purely academic limits and is an important part of life as we know it; just think of the fact that the enzymes, catalysts of biological processes, are made up of whose activity is essentially regulated by the metal ion coordination. In another order of things in our everyday life, there are

plenty of inorganic products that greatly facilitate us.

Regarding the Sustainable Development Goals (SDGs), it is expected that students will be able to know in this subject how to apply the knowledge learned to acquire a special focus on sustainable management of raw materials and sustainable and environmentally compatible development (SDGs 11, 12, 13, 14, and 15). Design, select, and/or develop efficient chemical products and processes (SDG 7) that minimize their environmental impact (SDGs 14 and 15), utilize alternative raw materials, and generate less waste (SDG 11).

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

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

OTHER REQUIREMENTS

This subject is related to the two first year subjects General Chemistry I and II since in these subjects some basic thermodynamic, structural, bonding, acid-base and redox principles that were already introduced in the General Chemistry subjects.
It is recommended that all students enrolled in this course have completed and passed the subjects previously General Chemistry I and General Chemistry II.
The subject Inorganic Chemistry II completes this subject by studying the metallic elements of the peri

COMPETENCES / LEARNING OUTCOMES

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Act autonomously in learning, making well-founded decisions in various contexts, forming judgements based on experimentation and analysis, and applying knowledge to new situations.

Address new problems and propose strategies to solve them.

Collaborate effectively in work teams, assume responsibilities and leadership roles, and contribute to collective improvement and development.

Communicate effectively both orally and in writing, adapting to the context and audience.

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

Demonstrate both inductive and deductive reasoning skills.

Demonstrate critical and self-critical thinking, considering professional ethics, moral values and social implications of the different activities carried out throughout the degree.

Demonstrate the ability to analyse, synthesise and reason critically.

Distinguish between the qualitative and quantitative aspects of chemical problems.

Distinguish the principles, procedures and techniques used in the determination, separation, identification and characterisation of chemical compounds.

Evaluate the risks involved in the use of chemical substances and laboratory procedures.

Express ideas correctly, both orally and in writing, in any of the official languages of the Valencian Community.

Identify chemical elements and their compounds, including their extraction, structure, reactivity, properties and applications.

Identify chemical processes in everyday life.

Identify the main types of chemical reactions and their associated key characteristics.

Implement sustainable and environmentally friendly methodologies.

Interpret the relationship between the variation in the characteristic properties of chemical elements and the Periodic Table.

Propose creative and innovative solutions to complex situations or problems in the field, addressing diverse professional and social needs.

Relate theory to experimentation.

Solve problems effectively.

State the principles of thermodynamics and kinetics and their application in chemistry.

Understand and analyse, from the perspective of the degree programme, social inequalities based on sex and gender; integrate gender-sensitive approaches into problem-solving and solution design.

Use chemical terminology, nomenclature, conventions and units correctly.

DESCRIPTION OF CONTENTS

1. Concept of Inorganic chemistry

Concept of inorganic chemistry. Introduction to inorganic chemistry. Presentation of the periodic table. Source and abundance of the chemical elements.

Review of basic structural concepts. Types of compounds: classification by the type of link and structural. Main types of structures of non-molecular compounds.
Review of basic thermodynamic concepts. Binding energy. Lattice energy. Thermodynamic cycles for the

2. Review of basic concepts

Review of basic structural concepts. Types of compounds: classification by the type of link and structural. Main types of structures of non-molecular compounds.analysis of the stability of molecular substances and Ionic compounds.
Review of concepts of solubility. Thermodynamic cycles for the analysis of the phenomenon of the solubility of ionic salts in water.

3. Acid-base and redox reactions

Reactions acid-base and redox. Acid-base concepts. The solvent system. Hard and soft acids. Orbital border in acid-base reactions. Reduction potential. Kinetic factors. Redox stability in water. Latimer and Frost diagrams.

4. Hydrogen

Hydrogen. Isotopes. Obtention of hydrogen, reactivity and applications. Hydrides: Classification, structure, bond and reactivity. Hydrogen bond. Hydrogen as an energy vector.

5. Group 18: Noble gases

Group 18: Noble Gases. General characteristics of the group. Obtention and application of the noble gases. Main compounds of noble gases

6. Group 17: Halogens

Group 17: halogens. General characteristics of the group. Singularity of F. Obtention and application of the elements. Halides. Oxo acids and oxosals. Interhalogen compounds and pseudohalogens. Biological aspects of the elements of the Group

7. Group 16: Chalcogens

Group 16: Chalcogens. General characteristics of the group. Electronic structure of the dioxygen and its reactivity. Ozone: structure, reactivity and environmental importance: ozone and photochemical smog. Oxides: structure and acid-base behavior. Water. Hydrogen peroxide. Sulphur: concatenation, allotropy, and reactivity. Sulphides, halides, oxides, oxo acids of sulphur oxosals. Preparation of sulfuric acid. Chemistry of selenium and tellurium. Biological aspects of the elements of the group.

Group 15: N, P, As, Sb. General characteristics of the group. Uniqueness of the b. obtaining and application

8. Group 15: N, P, As, Sb

of the elements. The inert pair effect. Electronic structure of the dinitrogen molecule and its reactivity. Oxidation of nitrogen, chemical redox States. Hydrides, oxides, oxo acids and nitrogen oxosals. Acid rain. Preparation of nitric acid. Allotropy and reactivity of phosphorus. Oxides, oxo acids and oxosals. Phosphate esters. Chemistry of arsenic and antimony. Biological aspects of the elements of the group.

9. Group 14. C, Si and Ge

Group 14. C, Si and Ge. General characteristics of the group. Singularity of C. Preparation and application of the elements. Allotropy of carbon and reactivity. Catenation. Oxides of carbon. Greenhouse effect and global warming. Carbon dioxide and carbonates. Halides of carbon: CFCs and substitutes. Cyanides. Silicon dioxide. Structural diversity of silicates. Cement, glass, zeolites, ceramics and silicones. Chemistry of germanium. Biological aspects of the elements C, Si and Ge.

10. Boron

Boron. Elemental boron. Structure, obtention and applications. Boron oxide, boric acid and borates. Borides and boron halides. boron hydrides and related compounds.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Tutorials	9,00
Theory	51,00
Total hours	**60,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	0,00
Independent study and work	43,00
Preparation of lessons	26,00
Preparation for assessment activities	21,00
Resolution of case studies	0,00
Total hours	**90,00**

TEACHING METHODOLOGY

The subject is raised so that the student is the protagonist of their own learning and is structured in the

following way:

Lectures. In these classes the teacher will give an overview of the topic object of study with special emphasis on the new aspects or particular complexity. It also will carry out the specific application of the knowledge that students have acquired via the resolution of issues and practical problems that students have previously worked. Logically, these classes will be complemented with the of personal study time referred to section III.

Group tutoring. Students attend them in smaller groups. In them, the teacher can propose activities, as resolution of issues or problems, resolution of doubts, approach to discussions, etc., which will contribute to the final score, as it considers the teacher.

Seminars. Seminars will be also included, with the aim to complement the lectures.

EVALUATION

FIRST CALL

The knowledge acquired will be assessed through a final written exam on the date established by the faculty, which will account for 80 % of the final note. The exam will consist of objective questions about the knowledge considered basic (see the list of learning outcomes), and numerical and relationship problems that require the students to consider aspects of the subject appearing on various topics.

The student's participation in any of the activities proposed during the academic period that are related to the subject will be valued with 20% of the final grade, among which it is worth highlighting:

- Delivery of solved problems and exercises.
- Attendance to the group tutoring classes, and reasoned and clear participation in discussions.
- Troubleshooting and raising doubts.
- Carrying out tasks and/or oral presentations.
- Carrying out written tests.
- Class attendance.
- Any other complementary training activity determined by the professor.

The final mark will be that of the final written exam plus the one obtained in all the activities that are proposed, with the percentage indicated for each one of them. To pass the subject, the student must obtain a minimum grade of 4.5 in the final written exam and the weighted average must be equal to or greater than 5.

SECOND CALL

In the second call, the same conditions and percentages described for the first call. Students will maintain the grade obtained in the activities proposed during the course for this second call. The second call written

exam will be held on the date set by the Faculty.

Final warning

Copying or plagiarism of any assignment that is part of the evaluation will make it impossible to pass the course, and the student will be subject to the appropriate disciplinary procedures.

Please note that, according to Article 13 d) of the University Student Statute (RD 1791/2010, December 30), "*it is the duty of a student to refrain from using or cooperating in fraudulent procedures in evaluation tests, in the work performed or in official University documents*".

REFERENCES

BASIC

- Housecroft, C. E.; Sharpe,A. G.; Inorganic Chemistry, ed. Pearson Prentice-Hall, 3ª edició, 2008. ISBN: 978-0-13-175553-6. (In a separate format, the answer manual for the exercises has been published. There is a Spanish translation of the 2nd edition and the answer manual. Ed. Pearson Prentice-Hall, 2006.)
- Atkins,P. W.; Overton,T. L.; Rourke, J.P.; Weller, M.T. y Armstrong, F. A.; Shriver & Atkins: Inorganic Chemistry, ed. Oxford, 5ª edición, 2010. ISBN: 978-0-19-923617-6. (There is a Spanish translation of the fourth edition by Ed. McGraw-Hill, 2008).
- Rayner-Canham,G.; Overton,T.; Descriptive Inorganic Chemistry y Student solutions manual for descriptive inorganic chemistry, ed. W.H. Freeman, 4ª edición, 2006.

ADDITIONAL

- Cotton,F.A.; Wilkinson,G.; Murillo; C.A.; Bochmann, M.; Advanced Inorganic Chemistry, ed. Wiley-Interscience, 6ª edición, 1999. ISBN: 978-0-471-19957-1 There is a Spanish translation of the 4th edition, F.A. Cotton y G. Wilkinson, Química Inorgánica Avanzada, ed. Limusa, 1987.
- Greenwood, N. N.; Earnshaw, A.; Chemistry of the Elements, ed. Elsevier Science, 2ª edición, 1997 (corregida en 1998, con reimpresiones en 2001 y 2002). ISBN: 0-7506-3365-4.
- Wells,F.; "Química Inorgánica Estructural", 4ª ed. Reverté, Barcelona, 1994. ISBN-13: 978-8429175240; ISBN-10: 8429175245