PERSONA CIÈNCIA EMPRESA
UNIVERSITAT RAMON LLULL

COURSE: INORGANIC CHEMISTRY

SUBJECT MATTER: Inorganic Chemistry
MODULE: Specific Technology
PROGRAM: Degree in Chemical Engineering

GENERAL CHARACTERISTICS*

Type: ☐ Basic Formation, ☑ Compulsory, ☐ Elective
☐ Final Degree Project, ☐ Internship

Duration: Annual
Semester/s: 3rd and 4th
Number of ECTS credits: 10
Language/s: Catalan, Spanish, English

DESCRIPTION

SHORT DESCRIPTION AND JUSTIFICATION

Inorganic Chemistry is, together with Organic Chemistry, Analytical Chemistry and Physical Chemistry, one of the four fundamental areas of chemistry.

This subject, framed in the degree in Chemical Engineering, focuses on the systematic study of the chemical elements. For its study, the elements are grouped (main group –s and p elements-, transition elements or d, and f elements - lanthanides and actinides -).

Prior to the systematic study of the elements, concepts related to the structure, bonding and properties of elements and inorganic compounds are presented and studied. Thus, these concepts are applied in the study of the different elements.

Additionally, the Chemistry of Coordination Compounds and Radiochemistry are introduced. Introduction to the Chemistry of Coordination is carried out mainly related to the transition elements. In this way, students can understand the stability of that type of compounds and justify their main properties.

COMPETENCES

- To be able to understand and apply knowledge of Inorganic Chemistry for its application in the field of Chemical Engineering. (CB1, E2).
- To be able to identify, formulate and solve problems in the field of Inorganic Chemistry (CB2, E7).
- To be able to assess the risks in the use of chemical and biological substances and the processes in which they are involved (E11).
- To be able to communicate effectively both orally and in writing (T3).
- Be able to assess the impact of their professional activity on the sustainable development of society (T5).
- Knowledge of material and energy balances, biotechnology, material transfer, separation operations, chemical reaction engineering, reactor design, and valorization and transformation of raw materials and energy resources. (TE1).

PREREQUISITES

According to the program planning and academic regulations.

CONTENTS

1.- Fundamental concepts
- 1.1.- Inorganic Chemistry nomenclature.
- 1.2.- Redox equilibria: Frost diagrams, Latimer diagrams, Pourbaix diagrams.
- 1.3.- Application of thermodynamic concepts in inorganic chemistry. Ellingham diagram.
- 1.4.- Origin of the Elements

2.- s and p Elements
- 2.1.- Hydrogen.
- 2.2.- Group 1: Li, Na, K, Rb, Cs, Fr
- 2.3.- Group 2 : Be, Mg, Ca, Sr, Ba, Ra
- 2.4.- Boron
- 2.5.- Group 13: Al, Ga, In, Tl
- 2.6.- Carbon
- 2.7.- Silicon
- 2.8.- Group 14: Ge, Sn, Pb.
- 2.9.- Nitrogen
- 2.10.- Phosphorus
- 2.11.- Group 15: As, Sb, Bi.
- 2.12.- Oxygen
- 2.13.- Sulfur
- 2.14.- Group 16: Se, Te, Po
- 2.15.- Group 17: F, Cl, Br, I, At.
- 2.16.- Group 18: He, Ne, Ar, Kr, Xe, Rn

3.- Coordination compounds.
- 3.1.- Theories of bonding in coordination compounds
- 3.2.- Stability of coordination compounds

4.- Transition elements.
- 4.1.- Elements of the first transition series
- 4.2.- Elements of the second and third transition series
- 4.3.- Group 3: Sc, Y, La, Ac
- 4.4.- Group 12: Zn, Cd, Hg.

5.- Lanthanides and Actinides
- 5.1.- Lanthanides
- 5.2.- Actinides

METHODOLOGY

LEARNING ACTIVITIES

Learning activities	Hours	ECTS Credits	Competences
Lectures	89	3.3	CB1, E2, CB2, E7, CB4, T3, TE1
Case and Problem-Solving Sessions	14	0.5	CB1, E2, CB2, E7, CB4, T3, TE1
Seminars	5	0.2	CB1, E2, CB2, E7, CB4, T3, TE1
Practical & lab work	-	-	
Oral presentations	-	-	
Personal Study	154	5.7	CB1, E2, CB2, E7, T3, TE1
Assessment Tasks (Exams, Continuous Assessment...)	8	0.3	CB1, E2, CB2, E7, CB4, T3, TE1
TOTAL	**270**	**10**	

TEACHING METHODOLOGY

The teaching methodology is based on concept presentation sessions, in which the fundamental contents of the course are presented to the student. In these sessions, questions related with the topics presented will be asked to the student. Short reports related with these questions can be requested to the students.

The concept presentation sessions will be complemented with sessions of solving exercises and problems. These problems correspond to concepts of the subject and allow the students to acquire a practical projection thereof.

With the seminars both theoretical and practical concepts that present a major difficulty of understanding for the student will be strengthened.

The learning support system will provide to the student collections of problems, documents related to the sessions, self-assessment tests and bibliographical resources. All this material can be used for personal study.

ASSESSMENT

ASSESSMENT METHODS

Assessment Methods	Weight	Competences
Final Exam	40%	CB1, E2, CB2, E7, E11, CB4, T3, TE1
Midterm Exam/s	40%	CB1, E2, CB2, E7, E11, T3, TE1
Follow-up Activities	15 %	CB1, E2, CB2, E7, E11, CB4, T3, TE1
Reports and presentations	-	
Lab or field work	-	
Projects	-	
Host Student Evaluation	-	
Participation	5%	CB1, E2, CB2, E7, E11, CB4, T3, TE1

LEARNING OUTCOMES

- The student must know how to interpret the meaning of the main properties of the elements, the acid - base equilibria and redox equilibria. (.(→E2, CB1, TE1)
- The student must demonstrate knowledge of the chemical reactivity of the elements, and their ability to pose and solve the problems of the concepts of the course. (→E2, CB1, E7, CB2, TE1).
- The student must demonstrate the ability to design processes to obtain inorganic chemicals from materials and must demonstrate their knowledge of the main chemical properties of important chemicals. (→E7, CB2, E11, T3, TE1)
- The student must demonstrate its ability to prevent hazardous situations arising from chemical processes designed incorrectly. (→E11, T3, TE1)
- The student must demonstrate the ability to communicate effectively both orally and in writing. (→CB4).

QUALIFICATION

The evaluation of the course will consider the scores in the continuous assessment activities, partial exams and final exam. All these qualifications will be over 10 and have a maximum of 10.

First call:

- There is one midterm exam, which represents 40% of the qualification of the subject. To pass the course, the qualification of this exam must be equal to or higher than 3.
- There is one final exam, which accounts for 40% of the qualification of the subject. To pass the course, the average of the partial and final exam qualifications must be equal to or higher than 4.

- Continuous assessment activities represent 15% of the qualification of the subject. To pass the course, the qualification of these activities should be equal to or higher than 4.
- Participation in sessions represents 5% of the qualification of the subject.
- In the case of not reaching the minimum grades to pass the subject (final exam and / or continuous assessment activities), the qualification of the subject in this call will be the lowest grade obtained in these evaluation methods.

Following calls:

- The midterm exam and the final exam of the first call can be replaced by a single final exam. In this case, the final exam will represent 80% of the qualification of the subject.
- The other criteria are those of the first call.

ASSESSMENT OF THE COMPETENCES

For the evaluation of CB1 and E2 competences, the qualification of the exams will be used as an indicator.

For the evaluation of CB2 and E7 competences, the qualification of the exams will be used as an indicator.

For the evaluation of E11 competence, the qualification of the exams will be used as an indicator.

For the evaluation of CB4 competence, the qualification of the exams and the participation will be used as indicators.

For the evaluation of T3 competence, the qualification of the exams and the participation will be used as indicators.

For the evaluation of TE1 competence, the qualification of the exams and the participation will be used as indicators.

BIBLIOGRAPHY

A. Earnshaw, N.N. Greenwood, Chemistry of the Elements. 2ª Edición, Butterworth-Heinemann, 1997.

- F. A. Cotton, G. Wilkinson, Química Inorgánica Avanzada. 7ª Reimpresión, Ed. Limusa-Wiley, 1998.
- D.F. Shriver, P.W. Atkins, C.H. Langford, Química Inorgánica, Vols 1 y 2. 2ª Edición, Editorial Reverté, 1998.
- C. Housecroft, A. Sharpe, Química Inorgánica. 2ª Edición, Pearson Prentice Hall, 2006
- M. Gerloch, E.C. Constable, Transition Metal Chemistry, VCH, 1994

DOCUMENT HISTORY

PREVIOUS REVISIONS

31st August 2017, Dr. Jordi Abellà
10th September 2016, Dr. Jordi Abellà
8th September 2014, Dr. Jordi Abellà
17th September 2012, Dr. Jordi Abellà
16th September 2011, Dr. Jordi Abellà
15th June 2010, Dr. Jordi Abellà

CURRENT REVISION

7th September 2018, Dr. Jordi Abellà