

27208 - Inorganic Chemistry I

Información del Plan Docente

Academic Year	2017/18
Faculty / School	100 - Facultad de Ciencias
Degree	452 - Degree in Chemistry
ECTS	9.0
Year	2
Semester	Annual
Subject Type	Compulsory
Module	---

1.General information

1.1.Introduction

1.2.Recommendations to take this course

1.3.Context and importance of this course in the degree

1.4.Activities and key dates

2.Learning goals

2.1.Learning goals

2.2.Importance of learning goals

3.Aims of the course and competences

3.1.Aims of the course

3.2.Competences

4.Assessment (1st and 2nd call)

4.1.Assessment tasks (description of tasks, marking system and assessment criteria)

5.Methodology, learning tasks, syllabus and resources

5.1.Methodological overview

The teaching methodology is based on lectures in which the teacher exposes and explains the subject. Students are encouraged to participate and discuss different aspects of the subject in order to develop critical thinking and inquiry-based learning (7 ECTS).

The teaching is complemented with sessions dedicated to problem discussion and solving. These sessions help the students to be more proactive about using the knowledge and skills they have been learning to solve problems that they

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may encounter in the world of work or in further levels of study (2 ECTS).

5.2. Learning tasks

The learning program offered to the student to help achieve the expected results includes the following activities:

1. Lectures: acquisition of knowledge of Inorganic Chemistry (70 sessions of 50 min).
2. Problem discussion and solving (20 sessions of 50 min).

5.3. Syllabus

Chapter 1. Acids and bases. Brönsted acids and bases. Periodic trends in the Brönsted acidity and basicity. Compounds with hydroxyl groups. Pauling rules. Acidic properties of the hydrated cations. Acid-base behavior of the oxides. Acid-base behavior in non-aqueous solvents: liquid ammonia and sulfuric acid. Lewis acids and bases. Coordination compounds: types of ligands and thermodynamic considerations. Hard and soft acids and bases.

Chapter 2. Oxidation and reduction. Redox reactions. Cell potentials and Gibbs energy. Reduction potentials. Nernst equation. Relative stability of the different oxidation states. Latimer and Frost-Ebsworth diagrams.

Chapter 3. Structure and energetics of metallic and ionic solids. Crystal lattices. Packing of spheres. Crystal structure of metals. Alloys. Bonding in metals and semiconductors. Ionic solids. Ionic radii. Crystal structures of ionic solids. Lattice energy. Defects in solid state lattices.

Chapter 4. Hydrogen. Hydrogen and its ions. Isotopes of hydrogen. Dihydrogen: preparation, physical properties and applications. Hydrogen bonding. Polar and non-polar hydrogen bonds. Binary hydrides.

Chapter 5. The group 17 elements (halogens). Introduction. Physical properties. Occurrence in nature. Preparation of the elements. The elements, properties and applications. Halides: types, structures, synthesis and reactivity. Hydrogen halides. Interhalogen compounds. Oxides and oxoderivatives of halogens.

Chapter 6. The group 16 elements (chalcogens). Introduction. Abundance, occurrence, extraction and uses. Allotropes of the elements. Physical and chemical properties. Hydrides and anions of the elements. Halides. Oxides: structure, properties and synthesis. Compounds of S, Se and Te with oxygen.

Chapter 7. The group 15 elements. Introduction. Abundance, occurrence, extraction and uses. Structure, physical and chemical properties. Hydrides and anions of the elements. Nitrides, phosphides and arsenides. Halides. Compounds with oxygen: oxides, oxoacids and its salts. Phosphazenes.

Chapter 8. The group 14 elements. Introduction. Occurrence and abundance. Allotropes of the elements. Extraction, preparation and uses. Physical and chemical properties. Energy considerations. Hydrides, halides and anions of the elements. Compounds with oxygen: oxides, oxoacids and its salts. Silicones or siloxanes.

Chapter 9. The group 13 elements. Introduction. Occurrence, extraction and uses. Physical and chemical properties. Hydrides, halides and complex halides. Compounds with oxygen. Borides. Electron-deficient borane and carbaborane clusters.

Chapter 10. The alkali metals. Introduction. Physical properties. Occurrence, extraction and uses. Reactivity. Halides. Oxygen compounds. Chemistry in aqueous solution. Macrocyclic complexes. Chemistry in liquid ammonia.

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Chapter 11. The alkali earth metals. Introduction. Physical properties. Occurrence, extraction and uses. Reactivity. Halides. Oxides and hydroxides. Complex ions in aqueous solution. Diagonal relationship between Li and Mg or Be and Al.

Chapter 12. The noble gases. Introduction. Occurrence, extraction and uses. Physical properties. Compounds of xenon. Compounds of krypton and radon.

Chapter 13. Introduction to molecular symmetry. Symmetry operations and symmetry elements. Point groups.

5.4. Course planning and calendar

The schedule of sessions is published in the bulletin board and web page of the Faculty of Science:
<http://ciencias.unizar.es/web/horarios.do>

5.5. Bibliography and recommended resources

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| BB | Housecroft, Catherine E.. Química inorgánica / Catherine E. Housecroft, Alan G. Sharpe ; traducción, Pilar Gil Ruiz ; revisión técnica, José Ignacio Álvarez Galindo ... [et al.] . - 2ª ed. Madrid [etc.] : Pearson Prentice Hall, D.L. 2006 |
| BB | Shriver & Atkins Química inorgánica / Peter Atkins ... [et al.] ; traducción técnica, Emilio Sorde Zabay ; revisión técnica, Rodolfo Álvarez Manzo, Oralia Orduño Fragoza. - 4ª ed., 1ª ed. en español México D. F. : McGraw-Hill/Interamericana, cop. 2008 |
| BC | Advanced inorganic chemistry / F. Albert Cotton, Geoffrey Wilkinson, Carlos A. Murillo, Manfred Bochmann, [with a chapter on boron by Russell Grimes] . - 6th ed. New York [etc] : John Wiley and Sons, cop.1999 |
| BC | Cotton, Frank Albert. Química inorgánica básica / F. Albert Cotton, Geoffrey Wilkinson ; versión española Francisco González Vilchez ; revisión Francisco González García . - 1a. ed., 4a. reimp. México [etc] : Limusa, 1989 |
| BC | Greenwood, Norman Neill. Chemistry of the elements / N.N. Greenwood and A. |

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Earnshaw . - 2nd ed. Oxford :
Butterworth-Heinemann, 1997

BC Lee, John David. Concise inorganic
chemistry / J.D. Lee . - 5th ed., reprinted
London : Blackwell Science, 2002

BC Miessler, Gary L.. Inorganic chemistry /
Gary L. Miessler, Donald A. Tarr . - 2nd ed.
Upper Sadle River, New Jersey : Prentice
Hall, cop.1999

BC Rayner-Canham, Geoff. Descriptive
inorganic chemistry / Geoff
Rayner-Canham, Tina Overton . - 3rd ed.,
2nd print. New York : W. H. Freeman,
2003

BC Wiberg, Egon. Inorganic chemistry/
founded by A. Holleman; continued by
Egon Wilberg; first english edition by Nils
Wilberg; translated by Mary Eagleson,
William Brewer ; revised by Bernhard J.
Aylett. 1st english ed. San Diego [etc.]:
Academic Press; Berlin; New York: De
Gruyter, cop. 2001

URLs:

Ejercicios sobre la Tabla periódica de
elementos
[<http://www.educaplus.org/sp2002/tests/test1.html>]

Complementary material : exercises, questions, presentations, etc. will be available to students in reprography and in the website: <https://moodle2.unizar.es/add/>.