27208 - Inorganic Chemistry I

Información del Plan Docente

Academic Year	2018/19
Subject	27208 - Inorganic Chemistry I
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.Aims of the course

1.2.Context and importance of this course in the degree

1.3.Recommendations to take this course

2.Learning goals

2.1.Competences

2.2.Learning goals

2.3.Importance of learning goals

3.Assessment (1st and 2nd call)

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

4.Methodology, learning tasks, syllabus and resources

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

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4.2.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 solving sessions(20 sessions of 50 min).

4.3.Syllabus

The course will address the following topics:

- Topic 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.
- Topic 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.
- Topic 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.
- Topic 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.
- Topic 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.
- Topic 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.
- Topic 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.
- Topic 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.
- Topic 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.
- Topic 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.
- Topic 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.
- Topic 12. The noble gases. Introduction. Occurrence, extraction and uses. Physical properties. Compounds of xenon. Compounds of krypton and radon.
- Topic 13. Introduction to molecular symmetry. Symmetry operations and symmetry elements. Point groups.

4.4.Course planning and calendar

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course, will be provided on the first day of class or please refer to the Facultad de Ciencias web (https://ciencias.unizar.es/grado-en-quimica-0).

4.5.Bibliography and recommended resources