



IDENTIFYING DATA

Chemistry: Chemistry II

Subject	Chemistry: Chemistry II			
Code	V11G200V01204			
Study programme	(*)Grao en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language				
Department				
Coordinator	Peña Gallego, María de los Ángeles			
Lecturers	García Fontán, María Soledad Losada Barreiro, Sonia Peña Gallego, María de los Ángeles Prieto Jiménez, Inmaculada Teijeira Bautista, Marta			
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General description	Chemistry II pretends to introduce a microscopic vision of the matter, providing to students the basis for the understanding of disciplines more specific, that will give in future courses, and explaining the nature of the matter.			

Competencies

Code	
C1	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: Major aspects of chemical terminology, nomenclature, units and unit conversions.
C2	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: types of chemical reactions and its main characteristics
C5	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: Characteristics of the different states of matter and the theories used to describe them
C9	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: characteristic properties of the elements and their compounds, including group relationships and variations in the periodic table
C12	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: structural features of chemical elements and their compounds, including stereochemistry
C19	Apply knowledge and understanding to solve basic problems of quantitative and qualitative nature
D1	Communicate orally and in writing in at least one of the official languages of the University
D3	Learn independently
D4	Search and manage information from different sources
D6	Use mathematics, including error analysis, estimates of orders of magnitude, correct use of units and data representations
D7	Apply theoretical knowledge in practice
D8	Teamwork
D9	Work independently
D12	Plan and manage time properly
D13	Make decisions
D14	Analyze and synthesize information and draw conclusions
D15	Evaluate critically and constructively the environment and oneself

Learning outcomes

Expected results from this subject	Training and Learning Results
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Interpret the functions of radial distribution and the angular representations of the s, p, d and f orbitals. Describe the configuration in the fundamental state of atoms and ions. Justify the variations of different atomic parameters along the Periodic Table. Interpret the electronegativity and the polarizability of an atom.	C5	D1
	C9	D3
	C19	D4
		D6
		D7
		D8
		D9
		D12
		D13
		D14
		D15
Recognize the atomic orbitals involved in a bonding. Build diagrams of OM for diatomic molecules and deduce properties of the bonding. Define overlap integral. Apply the method of hybridization to explain the bonding in simple molecules.	C5	D1
	C19	D3
		D4
		D7
		D8
		D9
		D12
		D13
		D14
Describe the state of aggregation of the elements and his behaviour in front of oxygen and water. Describe the natural resources of the elements and some methods of obtaining.	C5	D1
	C9	D3
		D4
		D7
		D8
		D9
		D12
		D14
Use the models of bonding to explain the structure of the main functional groups. Relate its structure with its macroscopic properties.	C1	D1
	C9	D3
		D4
		D7
		D8
		D9
		D12
		D14
Identify the acidic protons in an Brönsted acid. Classify the Brönsted acids. Predict the acidity and basicity of organic compounds. Identify acids and bases of Lewis and types of acid-base reactions. Identify acids and bases as hard or soft and explain its interaction.	C1	D1
	C2	D3
	C19	D4
		D7
		D8
		D9
		D12
		D14
Represent the three-dimensional structure of organic molecules. Apply the principles of stereochemistry. Determine the absolute configuration. Apply the nomenclatures R/S and Z/Y. Explain the bonding solids. Relate structure and properties in amorphous solids. Describe the superconductivity. Interpret one model structure. Predict the coordination number in function of the relation of ionic radii. Use the cycle of Born-Haber to determine the lattice enthalpy.	C1	
	C12	
	C5	D1
	C19	D3
		D4
		D7
		D8
		D9
		D12
		D14
Describe the types of polymers. Describe the types of colloids and his properties. Explain the behavior of surfactants.	C9	D1
		D3
		D4
		D7
		D8
		D9
		D12
		D14

Define the standard potentials of reduction. Calculate the variation of energy of Gibbs in a redox reaction. Explain an electrochemical cell. Predict the products and its quantities in an electrolysis.	C1 C19	D1 D3 D4 D7 D8 D9 D12 D14
Characterize the types of radiation in a radioactive disintegration. Write nuclear reactions. Calculate the nuclear binding energy and the half life of an isotope. Describe the reactions in nuclear chain. Enumerate examples of the use of radioisotopes.	C1 C19	D1 D3 D4 D7 D8 D9 D12 D14

Contents

Topic	
Subject 1: Atomic structure	Structure of the hydrogenic atoms: atomic orbital, function of radial distribution, forms of the atomic orbital. Polyelectronic atoms: Penetration and shielding, effective nuclear charge, "aufbau". Atomic parameters: atomic, ionic, covalent and van der Waals radius. Lanthanide contraction. Electronegativity. Polarizability.
Subject 2: Chemical bonding	Theory of OM. Types of orbital: sigma, pi, delta. Diagram of energies for diatomic homo- and heteronuclear molecules. Bonding in alkenes and alkynes.
Subject 3: Nuclear chemistry	Nuclear reactions. Types of radioactive disintegration. Stability of nuclei. Kinetics of the radioactive disintegrations. Artificial transmutations. Nuclear fission. Nuclear fusion. Nuclear radiation: effects and units. Applications of the radioactivity.
Subject 4: Solid state	Structure of the simple solids. Sphere packing. Structure of the metals. Alloys. Metallic bonding. Semiconductors. Ionic solids. Energetic aspects.
Subject 5: Elements of the main groups	Elements of the main groups. Physical properties. Chemical properties. Natural resources. Some methods of significant obtaining.
Subject 6: Acid-base	Acid-base theories. Brønsted acids and bases: acid and base strength. Concept of pKa. Relationship between structure and acidity. Lewis acids and bases: Definition, examples. Fundamental types of Lewis acid-base reactions. Dissolvent as acids and bases. Hard and soft acids and bases: Classification, interpretation of the interactions between hard and soft acids and bases.
Subject 7: Electrochemical	E° and Gibbs free energy. Nernst Equation. Concentration cells. Batteries. Fuel cells. Electrolysis. Commercial electrolytic processes. Corrosion.
Subject 8: Organic Compounds and functional groups	Structure and geometry. Approach and nomenclature of organic compounds. Physical properties.
Subject 9: Isomery	Geometrical isomery. Conformational stereoisomery. Configurational stereoisomery.
Subject 10: Polymers	Polymer types according to origin, composition, structure and behaviour in front of heat. Copolymerization. Mechanisms of polymerization. Molecular structure of the polymers. Biopolymers. Colloids and surfaces. Surface tension and surfactants.

Planning

	Class hours	Hours outside the classroom	Total hours
Master Session	26	38	64
Others	0	4	4
Troubleshooting and / or exercises	26	38	64
Long answer tests and development	2	10	12
Short answer tests	2	4	6

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Master Session	In these sessions, we present the general aspects of the program

Others	In the different activities we pay attention to transversal competitions collected in the memory of the degree.
Troubleshooting and / or exercises	Each week we employ two hours to the resolution of some problems or exercises proposed related with the matter. These exercises will be delivered previously to the student through the platform Tem@ expecting that the student work them. In these sessions, we can collect questions or short problems to control the progress of the students.

Personalized attention

Methodologies	Description
Troubleshooting and / or exercises	Students can ask teachers questions to understand the subject in the tutorial hours

Assessment

	Description	Qualification	Training and Learning Results
Others	In the different activities, we pay attention to transversal competitions collected in the memory of the degree.	5	D1 D3 D4 D6 D7 D8 D9 D12 D13 D14 D15
Troubleshooting and / or exercises	In the seminars we can collect questions or short problems in order to know the progress of the student.	20	C1 C2 C5 C9 C12 C19
Long answer tests and development	Test for evaluation of the competitions purchased in the matter. It is necessary a minimum of 4 on 10 in this test to take into account the other evaluation notes.	45	C1 C2 C5 C9 C12 C19
Short answer tests	The students will have two test along the course on the matter explained in the sessions and seminars	30	C1 C2 C5 C9 C12 C19

Other comments on the Evaluation

Students must attend all tests performed along the course.

The final note will be the highest obtained by comparing the final exam note and the final exam note ponderated with continuous evaluation. Assessment in July: It is governed by the above

Sources of information

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Basic Bibliography

Química. R. Chang. 10ª Ed. McGraw-Hill, 2010.

Química General, 10ª Ed. R. A. Petrucci, W. S. Harwood e F.G. Herring. Ed. Prentice Hall, 2011.

Química General, 5ª Ed. K.W. Whitten, R.E. Davis e M.L. Peck. Ed. McGraw-Hill, 1998.

Química. Brown, LeMay, Bursten, Murphy. 11ª Ed., Pearson Educación, 2009.

Química. McMurry, Fay. 5ª Ed. Pearson Educación, 2009

Principios de Química, 3ª Ed. Atkins, Jones. Ed. médica panamericana, 2005.

Complementary Bibliography

1. Chemical Bonding. M. J. Winter. Oxford : Oxford University Press, 1994.
2. Química General Superior. W.L. Masterton, E.J. Slowinski e C.L. Stanitski. Ed. McGraw-Hill Interamericana, 1987.
3. Química General. T.L. Brown, H.E. Lemay e B.E. Bursten. Ed. Prentice Hall, 1998.
4. Química General. P.W. Atkins. Ed. Omega, 1992.
5. Química Orgánica. L. G. Wade. Pearson Educación, 5ª ed. Madrid 2004.
6. Química Inorgánica Descriptiva. G. Rayner-Canham. Pearson Educación, 2ª Ed. 2000.

Recommendations

Subjects that continue the syllabus

Physical chemistry I/V11G200V01303

Inorganic chemistry I/V11G200V01404

Organic chemistry I/V11G200V01304

Subjects that are recommended to be taken simultaneously

Physics: Physics II/V11G200V01201

Geology: Geology/V11G200V01205

Mathematics: Mathematics II/V11G200V01203

Chemistry, physics and geology: Integrated laboratory II/V11G200V01202

Subjects that it is recommended to have taken before

Biology: Biology/V11G200V01101

Physics: Physics I/V11G200V01102

Mathematics: Mathematics I/V11G200V01104

Chemistry, physics and biology: Integrated laboratory I/V11G200V01103

Chemistry: Chemistry I/V11G200V01105
