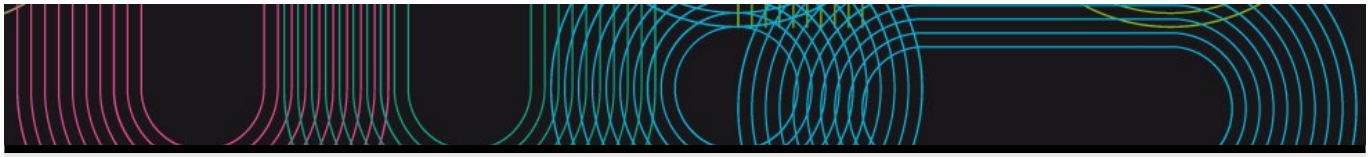

IDENTIFYING DATA				
Chemistry: Chemistry I				
Subject	Chemistry: Chemistry I			
Code	V11G200V01105			
Study programme	(*)Grao en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	Galician			
Department				
Coordinator	Tojo Suárez, María Concepción			
Lecturers	Bravo Bernárdez, Jorge Rodríguez Arguelles, María Carmen Tojo Suárez, María Concepción			
E-mail	ctojo@uvigo.es			
Web				
General description	Subject in the that impart contents of General Chemistry.			

Competencies	
Code	
A1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
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
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
D6	Use mathematics, including error analysis, estimates of orders of magnitude, correct use of units and data representations
D7	Apply theoretical knowledge in practice
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		
Use mol, empirical and molecular formula. Name binary compounds.	A1	C1 C19	D1 D3 D6 D7 D9 D12 D13 D14 D15

Describe the general structure of the atom and the main models. Use the periodic table.	A1	C1 C19	D1 D3 D6 D7 D9 D12 D13 D14 D15
Explain the covalent bond and Lewis structures. Predict the bond polarity. Name and formulate poliatomic ions. Describe the properties of ionic compounds.	A1	C1 C19	D1 D3 D6 D7 D9 D12 D13 D14 D15
Use the RPECV model. Determine the orbitals hybridization in one central atom and the corresponding molecular geometry. Identify sigma and pi bonds. Predict the polarity of molecules. Describe the different types of intermolecular interactions and used them to explain the melting and boiling points.	A1	C1 C19	D1 D3 D6 D7 D9 D12 D13 D14 D15
Adjust simple chemical equations and do stoichiometric calculations. Recognize types of general reactions. Explain neutralization reactions and oxidation-reduction reactions.	A1	C2 C19	D1 D3 D6 D7 D9 D12 D13 D14 D15
Explain the properties of gases. Calculate the quantities of gas reactants and products that take part in chemical reactions. Describe the ideal gases model and compare it with real gases.	A1	C1 C19	D1 D3 D6 D7 D9 D12 D13 D14 D15
Explain the properties of liquids, and the phase transitions that take place between solids, liquid and gases. Perform calculations on the basis of simple unitary cells and the dimensions of atoms and ions. Explain the metallic bonding and interprete the properties of metals, semiconductors and insulating materials.	A1	C1 C19	D1 D3 D6 D7 D9 D12 D13 D14 D15
Describe the different forms of energy. Recognise and use the thermodynamic language. Apply the Hess law. Calculate the variations of the different thermodynamic functions in a chemical reaction.	A1	C1 C2 C19	D1 D3 D6 D7 D9 D12 D13 D14 D15

Describe the properties of a system in chemical equilibrium. Calculate the equilibrium constant and the concentrations of reactants and products in system in chemical equilibrium. Use the Le Chatelier principle.	A1	C1 C2 C19	D1 D3 D6 D7 D9 D12 D13 D14 D15
Explain the properties of water. Predict the solubility. Describe the role of water in the acid-base reactions. Identify the conjugate base and the conjugate acid. Calculate the pH. Identify the oxidizing and reducing agents in a redox reaction and balance redox reactions.	A1	C1 C2 C19	D1 D3 D6 D7 D9 D12 D13 D14 D15
Define the main concepts of Chemical Kinetics. Determine the rate laws and the rate constants. Calculate the activation energy and the frequency factor. Explain the catalytic action.	A1	C1 C2 C19	D1 D3 D6 D7 D9 D12 D13 D14 D15

Contents

Topic	
Subject 1. Nature of Chemistry	The matter and its properties. Classification of the matter. Atoms and elements. Concept of mol. Chemical compounds. Formulation. Classification. Molecular mass and mol of a compound. Determination of empirical and molecular formula.
Subject 2. Chemical reactions	Classification. Chemical equations. Stoichiometric calculations. Limiting reactant. Yield.
Subject 3. Gases	Properties of gases. The atmosphere. Ideal gases law. Density and molar mass of gases. Partial pressures. Real gases.
Subject 4. Thermochemistry and the spontaneity of a chemical processes.	Thermochemistry and the spontaneity of chemical processes. Units of energy. Transfer of energy and phase transition. Thermochemical equations. Hess´s law. Entropy and second law of thermodynamics. Gibbs energy.
Subject 5. Chemical equilibrium	Equilibrium constant: determination and meaning. Calculation of equilibrium concentrations. Le Chatelier's principle. Gibbs energy and equilibrium constant.
Subject 6. Water and chemistry of solutions	Water as a solvent. How substances are solved. Temperature and solubility. Solubility equilibrium. Concept of Brönsted acid-base. Water autoionization. Ionization constants. Acid-base reactions. Hydrolysis. Buffer solutions. Redox reactions. Balance of redox reactions.
Subject 7. Condensed phases	Liquid state. Order in liquids. Solid state. Melting point. Boiling point. Phase equilibria. Phase diagram.
Subject 8. Chemical kinetics	Reaction rate. Effect of concentration. Rate lawand order of reaction. Mechanisms of reaction. Catalysis. Thermodynamic and kinetic stability.
Subject 9. The atom	Subatomic particles. Nuclear atom. Chemical elements. Isotopes. Electronic structure of atoms. Electronic configuration. Periodic table. Periodic properties.
Subject 10. Chemical bonding	Simple covalent bonds and Lewis structures. Multiple covalent bond. Lewis structures and resonance. Polarity of a bond and electronegativity. Coordinated covalent bonds. Ions and ionic compounds.
Subject 11. Molecular structure	Prediction of molecular forms: RPECV. Hybridization. Molecular polarity. Condensed phases formation. Intermolecular interactions.

Planning

	Class hours	Hours outside the classroom	Total hours
Master Session	26	26	52
Seminars	26	26	52

Troubleshooting and / or exercises	0	19	19
Long answer tests and development	4	14	18
Short answer tests	2	7	9

*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 this kind of sessions the general aspects of the program will be introduced in an structured way. The basics and the more important or difficult to understand aspects will be emphasized. The required material to study the next week will be available through the Tem@ platform. In this case, students are advised to study previously the available material and to consult the recommended bibliography to complete the information. In this way the explanations of the program contents will result in a better academic progress.
Seminars	Two classes a week will be devoted to students solve some of the problems or proposed exercises related with the subject. Some of these exercises or any other proposed by the teacher can be ordered to be qualified. As well as the correct exercises resolution, the suitable use of the language and handle mathematics (including error analysis, correct estimate of magnitude orders, use of units and ways of data presentation) will be valued.
Troubleshooting and / or exercises	The list of problems must be solved by students, with the help, if necessary, of the teacher during seminars or tutorial timetable. These list of problems can be requested in the established date if teacher ask for them. As well as the correct exercises resolution, the suitable use of the language and handle mathematics (including error analysis, correct estimate of magnitude orders, use of units and ways of data presentation) will be valued.

Personalized attention

Methodologies	Description
Troubleshooting and / or exercises	The students can consult all type of questions about the subject during the tutorial timetable.
Seminars	The students can consult all type of questions about the subject during the tutorial timetable.

Assessment

	Description	Qualification	Training and Learning Results		
Troubleshooting and / or exercises	The attendance (mandatory) to seminars, the involvement of students and the resolution by students of a serie of problems and/or exercises can be valued to monitor the student progress.	25	A1	C1 C2 C19	D1 D6 D7 D13 D14 D15
Long answer tests and development	Exams to evaluate the competences that students have acquired. After the lessons and trainning sessions finish, an exam will take place. A minimum score of 4 out of 10 in this exam is needed to take into account the rest of marks in the evaluation.	45	A1	C1 C2 C19	D1 D3 D6 D7 D9 D12 D13 D14
Short answer tests	Students must pass two tests of the contents explained in the magistral sessions and seminars.	30	A1	C1 C2 C19	D1 D3 D6 D7 D9 D12 D13 D14

Other comments on the Evaluation

The final mark in Chemistry I may be the highest mark between the final exam mark and the weighted averaged mark (which is obtained including continuous evaluation).

Call on July:
The mark obtained during the course in the section Troubleshooting and/or exercises is mantained.
The exam includes the whole list of topics of the training course. A minimum score of 4,5 out of 10 in this exam is needed to

pass the subject.

Sources of information
R. Chang, **Química**,
R. A. Petrucci, W. S. Harwood y F.G. Herring, **Química General**,
K.W. Whitten, R.E. Davis y M.L. Peck, **Química General**,
P. Atkins y L. Jones, **Principios de Química. Los caminos del descubrimiento**,
J.A. López Cancio, **Problemas de Química. Cuestiones y ejercicios**,
C.Orozco Barrenetxea, M.N. González Delgado y A. Pérez Serrano, **Problemas Resueltos de Química Aplicada**,

Recommendations
Subjects that continue the syllabus
Chemistry: Chemistry 2/V11G200V01204
Subjects that are recommended to be taken simultaneously
Biology: Biology/V11G200V01101
Physics: Physics I/V11G200V01102
Mathematics: Mathematics I/V11G200V01104
Chemistry, physics and biology: Integrated laboratory I/V11G200V01103