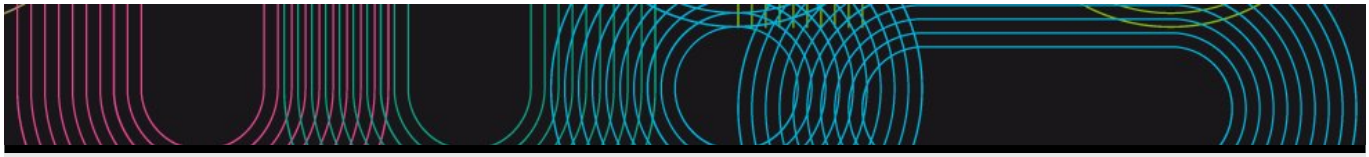

IDENTIFYING DATA				
Physical chemistry I				
Subject	Physical chemistry I			
Code	V11G200V01303			
Study programme	(*)Grao en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	1st
Teaching language	Spanish Galician			
Department	Physical Chemistry			
Coordinator	Hervés Beloso, Juan Pablo			
Lecturers	Hervés Beloso, Juan Pablo Mandado Alonso, Marcos			
E-mail	jherves@uvigo.es			
Web				
General description	Physical Chemical I is one of the first contacts of a student of Chemistry with the Physical Chemistry. This discipline studies the properties and the behaviour of the chemical systems employing the methods of the Physics. This matter presents the rigorous macroscopic treatment of chemical systems in equilibrium, systems already entered in Chemistry I. Taking advantage of the basic knowledge of the principles of the Thermodynamics, they will be applied to systems of chemical interest to obtain a quantitative description of them. For this purpose, it is fundamental to be familiarised with differential calculus in more than a variable and integral calculus in one variable, skill already seen in Mathematics II. The knowledge on the macroscopic description of the chemical systems that will be reached in this subject are complementary with the contents of the subject Physical Chemistry III the following year. The experimental applications of these knowledges will be studied in the subject of the second tern Physical Chemistry II.			

Competencies	
Code	
C6	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories in: principles of thermodynamics and their applications in chemistry
C18	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: principles of electrochemistry
C19	Apply knowledge and understanding to solve basic problems of quantitative and qualitative nature
C20	Evaluate, interpret and synthesize data and chemical information
C23	Present oral and written scientific material and scientific arguments to a specialized audience
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
D5	Use information and communication technologies and manage basic computer tools
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

Employ the concept of function of state to calculate the variations of the distinct functions of thermodynamic state of a pure substance.	C6 C19 C20 C23	D1 D3 D4 D5 D6 D7 D8 D9 D12 D13 D14 D15
Obtain the entropy of a substance from calorimetric measures	C6 C19 C20 C23	D1 D3 D4 D5 D6 D7 D8 D9 D12 D13 D14 D15
Establish if a process that suffers a pure substance is spontaneous or no from the calculation of the variations of the thermodynamic properties	C6 C19 C20 C23	D1 D3 D4 D5 D6 D7 D8 D9 D12 D13 D14 D15
Handle thermodynamic tables to obtain values of the distinct functions of thermodynamic state of reaction and calculate the thermodynamic functions of reaction to distinct temperatures	C6 C19 C20 C23	D1 D3 D4 D5 D6 D7 D8 D9 D12 D13 D14 D15
Calculate the fugacity function for a real gas from his equation of state or from experimental measures	C6 C19 C20 C23	D1 D3 D4 D5 D6 D7 D8 D9 D12 D13 D14 D15

Calculate the thermodynamic constant of reactions in solution, from the concentrations of the species or from the thermodynamic functions	C6 C19 C20 C23	D1 D3 D4 D5 D6 D7 D8 D9 D12 D13 D14 D15
Calculate the thermodynamic characteristics of a change of phase, and know the interval of applicability of the equations employed	C6 C19 C20 C23	D1 D3 D4 D5 D6 D7 D8 D9 D12 D13 D14 D15
Calculate the thermodynamic properties of an ideal solution from his composition	C6 C19 C20 C23	D1 D3 D4 D5 D6 D7 D8 D9 D12 D13 D14 D15
Calculate the colligative properties of a solution from the concentration of the solute and the properties of the dissolvent. Establish when these results can be applied to a real case	C6 C19 C20 C23	D1 D3 D4 D5 D6 D7 D8 D9 D12 D13 D14 D15
Calculate the activities and activity coefficients of non-electrolytic solutions and employ the suitable model for the calculation of the mean ionic activity coefficient. Obtain this coefficient from experimental measures	C6 C18 C19 C20 C23	D1 D3 D4 D5 D6 D7 D8 D9 D12 D13 D14 D15

Employ pertinent experimental measures of the galvanic cells to determine functions of state of reaction	C6 C18 C19 C20 C23	D1 D3 D4 D5 D6 D7 D8 D9 D12 D13 D14 D15
Determine the activity and/or the mean ionic activity coefficient of an electrolite by means of experimental measures of EMF of galvanic cells	C6 C18 C19 C20 C23	D1 D3 D4 D5 D6 D7 D8 D9 D12 D13 D14 D15
Analyse the importance of the interphase and of the distinct phenomena associated to the interphase in the thermodynamic processes of the material systems	C6 C19 C20 C23	D1 D3 D4 D5 D6 D7 D8 D9 D12 D13 D14 D15
Establish the importance of the superficial tension and the distinct processes associated in function of the nature of the system	C6 C19 C20 C23	D1 D3 D4 D5 D6 D7 D8 D9 D12 D13 D14 D15
Differentiate between processes of physical and chemical adsorption and describe the models employed for his description	C6 C19 C20 C23	D1 D3 D4 D5 D6 D7 D8 D9 D12 D13 D14 D15

Contents

Topic	
The laws of the thermodynamic in Chemistry.	First Law of thermodynamics. Internal energy. ** Enthalpy. Heat capacities . Thermochemistry. Second law of thermodynamics. ** Entropy. Molecular interpretation of the ** entropy. Third law of thermodynamics. Calculation of the variations of ** entropy.

Thermodynamic functions	Gibbs Equations. Maxwell relationships. Calculation of variations of the state functions . Open systems. Partial Molar quantities. Chemical potential. Chemical potential of an ideal gas. Chemical potential of the real gases.
Phase equilibrrium in systems of one component.	Concepts of component, phase and degree of *freedom. Equilibrium conditions between phases. Phses Rule. First order changes phases. Clapeyron and Clausius Equations.
Ideal Solutions.	Molar partial Volume. Gibbs-Duhem Equation. Ideal solutions: Raoult law. Vapour pressure diagrams. Ideal diluted solutions: Henry Law. Colligative Properties
Non-ideal Solutions.	Deviations of the Raoult law. Activity and activity coefficient . Electrolitic solutions. Debye-Hückel theory.
Chemical equilibrium	Equilibrium Conditions . Extent of reaction. perfect gas equilibria. Equilibrium is solution reactions. Response of equilibria to temperature. Le Chatelier´s principle. Acid-base equilibria. Solubility Product. salt effects. Electrochemical Cells. Nerst Equation.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	26	31	57
Seminars	26	38	64
Problem solving	0	14	14
Self-assessment	0	10	10
Essay questions exam	5	0	5

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

Methodologies

	Description
Lecturing	They will consist in the brief exposition by the professor of the fundamental aspects of each subject, employing the available material in the TEMA platform. Also numerical problems will be proposed for helping to comprise and settle concepts.
Seminars	Seminar will be devoted to the resolution of problems and will deepen on those aspects that present greater difficulties to the students. These classes will be mainly a task for the students under the supervision of the professor.

Personalized attention

Tests	Description
Self-assessment	Students will solve autonomously questionnaires-type test through the TEMA platform and will be individually tutorized by the professor.
Problem solving	Students will solve autonomously proposed problems and will be individually tutorized by the professor.

Assessment

	Description	Qualification	Training and Learning Results	
Problem solving	Problems proposed stop each subject of the subject.	Hasta un 12,5	C6 C18 C19 C20 C23	D1 D3 D4 D6 D7 D8 D9 D12 D13 D14 D15
Self-assessment	Proofs type test in the platform SUBJECT.	Hasta un 12,5	C6 C18 C19 C20	D3 D4 D5 D7 D9 D12 D13 D14 D15

Essay questions examExamination written especially *los contents of the subject.	Mínimo un 75	C6 C18 C19 C20	D1 D3 D4 D6 D7 D9 D12 D13 D14

Other comments on the Evaluation

Sources of information

Basic Bibliography

Complementary Bibliography

Levine, **Fisicoquímica**, McGraw-Hill. 5ª Ed,

Atkins, **Química Física**, Panamerica, 8ª Ed,

Engel, **Química Física**, Pearson,

Chang, **Fisicoquimica**, McGraw-Hill,

Rodríguez Renuncio, **Termodinámica Química**, Sintésis, 2ª Ed,

Levine, **Problemas de Fisicoquímica**, McGraw-Hill,

Rodríguez Renuncio, **Problemas resueltos de Termodinámica Química**, Sintésis,

Metz, **Fisicoquímica. Problemas y Soluciones**, McGraw-Hill,

Recommendations

Subjects that continue the syllabus

Physical chemistry II/V11G200V01403

Subjects that it is recommended to have taken before

Mathematics: Mathematics 2/V11G200V01203
Chemistry: Chemistry 1/V11G200V01105
Chemistry: Chemistry 2/V11G200V01204