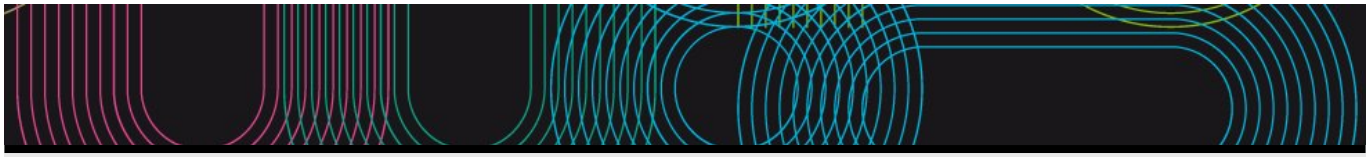

IDENTIFYING DATA				
Chemistry: Chemistry 2				
Subject	Chemistry: Chemistry 2			
Code	V10G061V01110			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	Graña Rodríguez, Ana María			
Lecturers	Correa Duarte, Miguel Ángel Estévez Guiance, Laura Graña Rodríguez, Ana María Mariño López, Andrea Prieto Jiménez, Inmaculada			
E-mail	ana@uvigo.es			
Web				
General description				

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
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
B4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
C6	Acquire the fundamentals and terminology of chemical processes.
D1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
D2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.

Learning outcomes				
Expected results from this subject	Training and Learning Results			
Knowledge and employment of basic concepts of thermodynamics. Knowledge of the processes of transfer of heat and the processes of mixture in marine means.	A1	B4	C6	D1 D2
Knowledge and understanding of the phase equilibrium and the phase changes.		B4		D1 D2
Knowledge of the model of ideal solutions and colligative properties. Apply the colligative properties to the water of the sea.	A5	B4	C6	D2
Knowledge of the properties of the real and electrolyte solutions. Knowledge and application of the concept of activity. Knowledge of the description of the sea water as an aqueous electrolyte solution and analysis of related properties.	A5	B4	C6	D1 D2
Application of the concept of chemical equilibrium to real and electrolyte solutions. Knowledge of the influence of the characteristics of sea water in chemical reactions in that medium.	A5	B4	C6	D1 D2

Contents
Topic

Principles of thermodynamics	The internal energy and the first principle. Enthalpy. Heat capacities. Ideal gases and first principle. Entropy and second principle. Calculation of entropy differences. Entropy, reversibility and irreversibility.
Thermodynamic functions	Gibbs and Helmholtz functions. Gibbs equations. Calculation of changes in state functions. Partial molar magnitudes. Chemical potential.
Phase equilibrium in one-component system	Phase equilibrium conditions. The phase rule. Phase diagram of water. The equations of Clapeyron and Clausius-Clapeyron.
Thermodynamics of ideal solutions	Chemical potential of an ideal gas. Ideal solutions. Vapor pressure. Ideal diluted solutions. Colligative properties: their influence on sea water. Osmotic pressure.
Thermodynamics of real solutions and electrolyte solutions	Deviations from Raoult's Law. Activity and activity coefficient. Determination of activities and activity coefficients. Chemical potential in electrolyte solutions and their activity coefficient. Debye-Hückel's theory. Thermodynamics of solvation of ions. Sea water as an electrolyte solution. Quantitative treatment of polyelectrolyte solutions.
Thermodynamics of chemical equilibrium	Chemical equilibrium and degree of progress of a reaction. Variation of the equilibrium constant with temperature. Chemical equilibrium in real solutions. Chemical equilibrium in electrolyte solutions. Effect of ionic strength on equilibrium.
Laboratory practices	Enthalpy of dissolution. Method of solubility: enthalpy. Hot. Heat capacity. Effect of ionic strength on solubility. Chemical balance. Solubility product. Balance constant. Activity. Coefficient of activity. Ionic strength and its effect on the equilibrium constant. Dissolution and neutralization heat. Calorimetric method. Enthalpy, heat, heat of reaction, thermal capacity. Integral and differential heat. Ebulloscopic increase. Raoult's Law. Chemical potential. Enthalpy of vaporization. Study of the liquid-vapor equilibrium of mixtures of two liquids. Rule of the phases. Liquid-vapor balance. Phase diagram. Raoult's Law. Chemical potential. Coefficient of activity

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	23	27	50
Seminars	14	42	56
Laboratory practical	15	5	20
Essay questions exam	4	8	12
Problem and/or exercise solving	2	10	12

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

Methodologies

	Description
Lecturing	Theoretical classes taught through a presentation (available to students in the TEMA website). In these classes will be introduced the basic contents, with emphasis in more important and difficult topics. Numerical problems will be also solved. The bulletins of problems will be also available in the TEMA website.
Seminars	Destined to the resolution of numerical problems and debate of the questions and exercises . The necessary material will be available in the TEMA website.
Laboratory practical	Application of techniques of laboratory in practical problems related with the subject.

Personalized assistance

Methodologies	Description
Lecturing	Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is advised to previously contact his/her teacher with reasonable anticipation.
Seminars	Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is advised to previously contact his/her teacher with reasonable anticipation.
Laboratory practical	Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is advised to previously contact his/her teacher with reasonable anticipation

Assessment

	Description	Qualification	Training and Learning Results			
Laboratory practical	Attendance required. Continuous assessment during class hours.	15		B4		D2
Essay questions exam	Written exams in which the level of theoretical knowledge and problem solving will be checked. Two optional partial exams will be made in the middle of the semester and at the end of it. The final grade will be the average of the one obtained in the two partial ones, provided that a minimum of 4 out of 10 is achieved in both. Alternatively, the student may submit to the final exam with all subject matter. The final exam grade must correspond to a minimum performance, which is set at 4 out of 10.	70	A1 A5	B4	C6	D1 D2
Problem and/or exercise solving	Resolution of problems at home and/or individual resolution of questionnaires in the TEMA website.	15	A1		C6	D1 D2

Other comments on the Evaluation

If the exam score (or the average of the two partial examinations) is lower than 4 out of 10, the final grade will be the one obtained in the exams.

Date, time and place of exams will be published in the official web of Marien Sciencies Faculty:

http://mar.uvigo.es/index.php/en/alumnado-actual-2/examenes-3

In the call of Julio the previous percentages will be respected, and the obtained qualifications obtained in practices and resolution of questions are maintained.

Students are strongly requested to fulfil a honest and responsible behaviour. It is considered completely unacceptable any alteration or fraud (i.e., copy or plagiarism) contributing to modify the level of knowledge and abilities acquired in exams, evaluations, reports or any kind of teacher□s proposed work. Fraudulent behaviour may cause failing the course for a whole academic year. An internal dossier of these activities will be built and, when reoffending, the university rectorate will be asked to open a disciplinary record

Sources of information

Basic Bibliography

Levine, **Fisicoquímica**, McGraw-Hill. 5ª Ed. (2004),

Atkins, **Química Física**, 8ª Ed. , Ed. Omega (2008),

Levine, **Problemas de Fisicoquímica**, 6ª Ed. McGraw-Hill (2014),

Complementary Bibliography

J. Pellicer, J. A. Manzanares, **100 Problemas de Termodinámica**, Síntesis (1996),

Laidler, Meiser, Sanctuary, **Physical Chemistry**, Edition, Houghton Mifflin (2002),

Klotz, Rosenberg, **Chemical Thermodynamics: Basic Theory And Methods**, 6th Ed., John Wiley (2000),

Rock, **Termodinamica Quimica**, Vicens-Vives (1989),

Rodríguez Renuncio, Ruiz Sánchez, Urieta Navarro, **Problemas resueltos de termodinámica química**, Síntesis. (2000),

W. Stumm, J. J. Morgan, **Aquatic Chemistry (Chemical equilibria and rates in Natural Waters)**, 3ª Ed. John Willey & Sons (1995).,

D. Eisenberg e D. Crothers, **Physical Chemistry with Applications to the Life Sciencies**, Benjamin/Cummings Publishing Company.(1979),

J. Wright e A. Colling, **Sea-water: its composition, properties and behaviour**, Oceanography, vol.2. The Open University. Pergamon Press.(1991),

Recommendations

Subjects that continue the syllabus

Chemical oceanography I/V10G061V01204
Chemical oceanography II/V10G061V01209

Subjects that are recommended to be taken simultaneously

Mathematics: Mathematics II/V10G061V01109

Subjects that it is recommended to have taken before

Physics: Physics I/V10G061V01102
Mathematics: Mathematics I/V10G061V01104
Chemistry: Chemistry I/V10G061V01105

Contingency plan

Description

=== EXCEPTIONAL MEASURES SCHEDULED ===
In front of it uncertain and unpredictable evolution of the sanitary alert caused by the COVID- 19, the University establishes an extraordinary planning that will actuate in the moment in that the administrations and the institution determine it attending to criteria of security, health and responsibility, and guaranteeing teaching in a scenario partial ou totally . These already scheduled measures guarantee, in the moment that is prescriptive, the development of teaching in a quick and effective way previously known by students and teaching staff through docnet tool.

=== ADAPTATION OF THE METHODOLOGIES ===
* Methodologies that stay the same
Lecturing (partial or totally virtual)
Seminars (partial or totally virtual)
* Methodologies that modify
Laboratory practical : they will be partial or totally substituted by videos and documents that allow the presentation of a report.
* Mechanism for virtual attention to the students (tutorial sessions)
Remote Campus, email and faitic.
* Modifications of the contained to impart:
None.
* Additional Bibliography to facilitate to car-learning:
None.
* Other modifications:
None.

=== ADAPTATION OF THE EVALUATION ===
Essay questions exams will be substitute total or partially by tests trough faitic with the same percentage of the qualification.
The resolution of problems and/or exercises remains with the same percentage of the qualification.
Continuous assessment during practical class hours will be substituted total or partially by the delivery of reports of practices.
* Additional information
None