UNIVERSIDADE DA CORUÑA

Teaching Guide				
Identifying Data				2015/16
Subject (*)	Química Analítica 1		Code	610G01011
Study programme	Grao en Química			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	1st four-month period	Second	Obligatoria	6
Language	SpanishGalicianEnglish			
Teaching method	Face-to-face			
Prerequisites				
Department	Química Analítica			
Coordinador	Gonzalez Castro, Maria Jose	E-mail	m.j.gonzalez.castro@udc.es	
Lecturers	Beceiro Gonzalez, Maria Elisa Gonzalez Castro, Maria Jose	E-mail	elisa.beceiro.gonzalez@udc.es m.j.gonzalez.castro@udc.es	
Web				
General description	This subject introduces the student in the Analytical Chemistry applying the chemical equilibria to the qualitative and quantitative analysis, establishing the bases of the discipline for the following academic courses. Therefore it exerts a basic role in the full Degree.			

Study programme competences / results	
Code	Study programme competences / results
A4	Knowledge of main types of chemical reaction and characteristics of each
A7	Knowledge and application of analytical methods
A16	Ability to source, assess and apply technical bibliographical information and data relating to chemistry
A17	Ability to work safely in a chemistry laboratory (handling of materials, disposal of waste)
A19	Ability to follow standard procedures and handle scientific equipment
A20	Ability to interpret data resulting from laboratory observation and measurement
A21	Understanding of qualitative and quantitative aspects of chemical problems
A23	Critical standards of excellence in experimental technique and analysis
A24	Ability to explain chemical processes and phenomena clearly and simply
B1	Learning to learn
B2	Effective problem solving
B3	Application of logical, critical, creative thinking
B4	Working independently on own initiative
B5	Teamwork and collaboration
C1	Ability to express oneself accurately in the official languages of Galicia (oral and in written)
C6	Ability to assess critically the knowledge, technology and information available for problem solving

Learning outcomes			
Learning outcomes	Study programme competences / results		
To apply the foundations of the chemical equilibria in the classical methods of analysis	A4 A7 A16 A24	B1 B2 B4	C1 C6
To learn the data handling and present the analytical results	A7 A16 A20	B1 B2 B4	C1

To understand the qualitative and quantitative aspects of the analysis	A4 A7 A20 A21 A24	B1 B2 B4	C1 C6
To acquire the basic skill in the laboratory of Analytical Chemistry (basic operations of the classical chemical analysis)	A7 A16 A17 A19 A20 A21 A23 A24	B1 B2 B3 B4 B5	C1 C6

Contents	
Topic	**Sub-topic**
Chapter 1: Analytical Chemistry	Definition and scopes Qualitative and quantitative analysis The analytical process Classification of methods and techniques
Chapter 2: Titrimetric Methods	Basic concepts, titrimetric reaction and types of Titrations Primary standards, standard solutions and standardized solutions Equivalence point and detection of the end point Titration curves Errors associated to titrimetric methods
Chapter 3: Acid-Base Titrations	Acid-Base titration theory. Titration curves Indicators for acid-base titrations. Selection of an indicator Strong acid versus strong base and vice versa Weak acid versus strong base and vice versa Titration of polyprotic acids or bases and their salts Titration of mixtures of acids or bases Acid-Base titration in nonaqueous solvents Applications
Chapter 4: Redox Titrations	Titration curves Redox indicators and their selection Oxidizing and reducing agents used prior to titration Titrations with oxidizing agents Titrations with reducing agents Determination of organic and inorganic compounds
Chapter 5: Complexometric Titrations	Coordination compounds of interest in titrimetric analysis Titration curves and the factors that affect them Metal ion indicators for chelometric titrations Titrations with polyaminocarboxylic acids
Chapter 6: Precipitation Titrations	Precipitation reactions of interest in titrimetric analysis Titration curves Titration of mixtures Detection of the end point: Mohr, Volhard and Fajans methods

Chapter 7: Gravimetric Analysis	Principles of the gravimetric analysis Steps and classification of gravimetric methods Precipitation process. Conditions for analytical precipitation Gravimetry by chemical precipitation. Treatment of precipitates Gravimetry by volatilization and absortion Gravimetric calculations
Chapter 8: Evaluation of Analytical Data	Definitions and basic concepts Statistic treatment for indeterminated errors The confidence limit Rejection of a result Tests of significance Analytical data how present them
Chapter 9: Qualitative Analysis	Application of chemical reactions to the qualitative analysis Analytical characteristics of chemical reactions (sensitivity, selectivity and safety) General and specific reagents Analytical characteristics and reagents for metal ions Analytical characteristics and reagents for anions
Module: Laboratory practice	Acid-Base Titrations Redox Titrations Complexometric Titrations Precipitation Titrations Gravimetric Analysis Qualitative Analysis. Identification reactions. Evaluation of Analytical Data

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A4 A7 A21 B1	24	36	60
Problem solving	A7 A16 A20 B1 B2 B4 C1	8	20	28
Seminar	A7 A20	2	0	2
Laboratory practice	A7 A16 A17 A19 A20 A21 A23 A24 B1 B2 B3 B4 B5 C1 C6	18	18	36
Short answer questions	A4 A7 A21 B4	0	0.5	0.5
Mixed objective/subjective test	A4 A7 A20 A21 A24 B1 B2 C1 C6	3	20	23
Personalized attention		0.5	0	0.5
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description
Guest lecture / keynote speech	In the lecture classes the professor will develop the fundamental contents of the program of the subject. The lecture sessions will take place in only one group and will have a length of 50 min. To make a good use of these sessions, the student will have to prepare previously the fundamental appearances of the topic to treat, employing the educational material (diagram that reflects the contents of each topic), which will be provided to the student through the Moodle platform. The student also will must read the chapter regarding to the topic to treat in the recommended bibliography

Problem solving	Classes in very small groups conceived like a group of activities in which the student must participate on a direct way. They are devoted to the resolution of the bulletins of problems, which previously will have been provided to the student through the Moodle platform, and that the students will have to realise of autonomous form for discussion in these classes. Besides, in these sessions any doubts on any appearance related with the lecture sessions will be resolved.
Seminar	Initial activity, before beginning the laboratory sessions, which consists on 1 session of 2 hours. In this session, the students will be exposed to the educational methodology that will be employed in the practices of laboratory.
Laboratory practice	6 laboratory sessions of 3 hours of length, in which the student will carry out the application of the theoretical concepts studied in the classroom. Each practice owns a script and a prelaboratory exercise which will be provided to the student (through Moodle) previously to the practice sessions. The realisation of the prelaboratory exercise before starting the laboratory practice is mandatory. The scripts will have questions that the students will have to answer and deliver once finished the practices. During laboratory sessions, and on a simultaneous way to the realisation of the experiments, the student will have to elaborate a fascicle of laboratory that collect the calculations, the experimental procedures and the necessary settings. The professor will review the notebook of each student in each laboratory session.
Short answer questions	Two exams based on short answer questions will be carried out about two of the topics of the subject. These exams will be realised employing the Moodle platform.
Mixed objective/subjective test	A written exam will be realised in the two official announcements of January/July, in which the learning of the student will evaluate by means of questions of theory, applied theory and resolution of problems.

Personalized attention	
Methodologies	**Description**
Laboratory practice Problem solving	The classes of problem solving and laboratory practice are conceived like activities in small groups in which the student participates directly. In this way both methodologies let personalised attention to the students allowing a better follow-up and orientation Besides, along the term an individual tutelage session of roughly half hour of length will be programmed. In this tutelage session, the professor will resolve the doubts which the student may find in the study of the subject and will be able to analyse if the process of learning of the student is suitable. The students will be able to do use of the schedule of tutelage sessions for asking queries or doubts about the subject

Assessment			
Methodologies	**Competencies / Results**	**Description**	**Qualification**
Laboratory practice	A7 A16 A17 A19 A20 A21 A23 A24 B1 B2 B3 B4 B5 C1 C6	The qualification obtained in the practices of laboratory will assume the 20% of the qualification of the entire subject. It will be evaluated the suitable realisation of the prelaboratory exercises, the skill in the realisation of the experimental work, the interpretation of the data obtained, as well as the correct realisation of the calculations, the answers to the questions of practices (that they will have to deliver) and the preparation of the notebook of laboratory.	20
Problem solving	A7 A16 A20 B1 B2 B4 C1	The control of the assistance to these activities, as well as the work realised before and during the same, contribute to the final qualification of the subject with a 10%. Besides, the evaluation of the learning with regard to the problem solving, also will take place in the mixed test.	10
Mixed objective/subjective test	A4 A7 A20 A21 A24 B1 B2 C1 C6	Written exam that will consist on questions of theory, applied theory and resolution of problems.	65

Short answer questions	A4 A7 A21 B4	Exams to be realised through the Moodle platform about two of the topics of the subject by means of short answer questions. Both topics will not be evaluated in the final mixed test.	5

Assessment comments
To pass the subject two basic requirements are needed: 1.-Regular assistance to the evaluables activities. The laboratory sessions are mandatory 2.-Reach a minimum qualification in each one of the evaluables activities. So much for the mixed exam and of brief answer, as for the practices and the classes of problema solving, this minimum qualification will cannot be lower than 4 (over 10). Anyway, to pass the subject the sum of the qualifications of the different activities cannot be lower than 5 (over 10). The student will obtain the qualification of No Presented when the student had attended less than 25% of the programmed academic activities, and does not assist to the final mixed exam. In the context of "continuous evaluation" the "second opportunity of July" is a second opportunity of realisation of the mixed test. Therefore, the practices, solution of problems and exams of brief answer will keep the qualifications obtained along the course, whereas the qualification of the mixed test of July will substitute to the obtained in the mixed test of January. The students evaluated in the "second opportunity" only will be able to opt to matrícula of honour if the maximum number of these for the corresponding course has not covered in his whole in the "first opportunity". Regarding to the next academic courses, the process of education-learning included into the evaluation, is referred to an academic course and, therefore, would go back to begin with a new course, including all the activities and procedures of evaluation that are programmed for the new course.

Sources of information	
Basic	- SKOOG D. A., WEST D.M. y HOLLER F. J (1997). Fundamentos de Química Analítica . Barcelona, Ed. Reverté - SKOOG D.A., WEST D.M., HOLLER F.J. y CROUCH S.R. (2005). Fundamentos de Química Analítica . Madrid, Ed. Paraninfo
Complementary	- HARRIS, DANIEL C (2007). Análisis Químico Cuantitativo . Barcelona, Ed. Reverté - GUITERAS J. RUBIO R. y FONRODONA G. (2003). Curso Experimental en Química Analítica . Madrid, Ed. Síntesis - SILVA M. y BARBOSA J. (2002). Equilibrios iónicos y sus Aplicaciones Analíticas . Madrid, Ed. Síntesis - LÓPEZ CANCIO J.A. (2005). Problemas Resueltos de Química Analítica . Madrid, Ed. Paraninfo - YÁÑEZ-SEDEÑO P., PINGARRÓN J.M. y MANUEL DE VILLENA F.J. (2003). Problemas Resueltos de Química Analítica . Madrid, Ed. Síntesis - BURRIEL MARTI F., LUCENA CONDE F., ARRIBAS JIMENO S. y HERNÁNDEZ MÉNDEZ J. (2001). Química Analítica Cualitativa . Madrid, Ed. Paraninfo - HARVEY D. (2002). Química Analítica Moderna . Madrid, Ed. McGraw-Hill

Recommendations
Subjects that it is recommended to have taken before
Química 1/610G01007 Química 2/610G01008 Química 3/610G01009 Química 4/610G01010
Subjects that are recommended to be taken simultaneously

Subjects that continue the syllabus
Química Analítica 2/610G01012
Química Analítica Instrumental 1/610G01013
Química Analítica Instrumental 2/610G01014
Química Analítica Avanzada e Quimiometría/610G01015
Other comments
To register on this subject it is recommended having passed the subject ?Chemical 3?

(*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.