



## IDENTIFYING DATA

### Analytical chemistry II

Subject	Analytical chemistry II			
Code	V11G200V01503			
Study programme	(*)Grao en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	9	Mandatory	3rd	1st
Teaching language	Spanish			
Department	Analytical and Food Chemistry			
Coordinator	González Romero, Elisa			
Lecturers	González Romero, Elisa Leao Martins, Jose Manuel			
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Web	<a href="http://quimica.uvigo.es/decanatoquimica/guias-docentes.html">http://quimica.uvigo.es/decanatoquimica/guias-docentes.html</a>			
General description	Global knowledge of Analytical Instrumental Techniques and its applications.			

## Competencies

Code	
C4	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: Basics and tools for solving analytical problems and characterization of chemical substances
C8	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: main techniques for structural determination, including spectroscopy
C17	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories in: metrology of chemical processes including quality management
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
C21	Recognize and implement good scientific practices for measurement and experimentation
C22	Process and perform computational calculations with chemical information and chemical data
C23	Present oral and written scientific material and scientific arguments to a specialized audience
C25	Handle chemicals safely, considering their physical and chemical properties, including the evaluation of any specific risks associated with its use
C26	Perform common laboratory procedures and use instrumentation in synthetic and analytical work
C27	Monitor, by observation and measurement of physical and chemical properties, events or changes, and document and record them in a consistent and reliable way
C28	Interpret data derived from laboratory observations and measurements in terms of their significance and relate them to the appropriate theory
C29	Demonstrate skills for numerical calculations and interpretation of experimental data, with special emphasis on precision and accuracy
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  
D17 Develop concern for environmental aspects and quality management

### Learning outcomes

Expected results from this subject	Training and Learning Results	
Justify the basic principles of the instrumental analysis and his field of application in base to the characteristics of the *analito and of application	C4	D1 D3 D6 D9 D12
Appropriated instrumental technique selection depending the phisycocochemicals properties of the analytes.	C4 C19 C20 C22	D1 D4 D6 D9 D12 D13
Description the quality parameters of an analytical method.	C4 C17 C19 C29	D1 D3 D4 D5 D6 D9
Advances in principles of: internal standard, external standard addition, standard solutions preparation, calibration and its applications in different instrumentl equipments.	C19 C21 C25 C26 C27 C28 C29	D1 D3 D4 D5 D6 D7 D8 D12 D13 D14
Estimation, interpretation and understand the different calibrations parameters of an instrumental method.	C17 C19 C20 C21 C26 C28 C29	D3 D4 D5 D6 D7 D8 D9 D12 D13 D14
Spectroscopic, electrochemical and separation (chromatographic and electrophoretic) techniques basis and its applications	C4 C8 C18 C19	D1 D3 D4 D7 D8 D9 D14
Instrumental equipment description and its functions required for spectroscopic, electrochemical measurements and separations techniques.	C4 C8 C18 C21 C26 C27	D1 D3 D4 D7 D9 D12 D13
Classify and proposes different applications fields of spectroscopic, electrochemical techniques and separation	C4 C8 C18 C19 C23	D1 D3 D4 D7 D8 D9 D13 D14

Implementation and application of spectroscopic and electrochemical techniques to carry out the determination of different analytes	C4	D1
	C18	D4
	C19	D5
	C21	D6
	C23	D7
	C25	D8
	C26	D12
	C27	D13
	C28	D14
	C29	D15
Implementation and application of chromatographic techniques with different detection modes for the separation, identification and quantification of different analytes	C4	D1
	C21	D4
	C23	D5
	C25	D6
	C26	D7
	C27	D8
	C28	D12
	C29	D13
		D14
		D15
		D17

## Contents

Topic	Subject (QAII) description
General Introduction	
1-Introduction to the instrumental technicians	Introduction Classification of the instrumental techniques Quality parameters Instrumental methodology analysis Calibration Molecular absorption spectrophotometry UV-VIS: Principles, Instrumentation and applications
2- Luminescent techniques	Basic principles Relation between fluorescence intensity and concentration Instrumentation Applications
3- Atomic Absorption Spectrometry	Basic principles Atomization systems, Flame, graphite furnace, hydrides generation and cold steam. Instrumentation Applications
4- Emission Atomic Spectrometry	Basic principles Emission sources. Flame and plasma. Plasma-Mass coupling Applications
5- Electroanalytical Techniques	Basic principles Classification Potentiometry: Ion Selective Electrode Voltammetry Conductimetry Coulometry Applications
6- Chromatographic methods	Basic principles Chromatographic modes Gas Chromatography Instrumentation Applications
7- Liquid Chromatography	Liquid chromatography: Normal, reverse phase and ionic Instrumentation Applications
8- Electrophoretic Techniques	Principles High resolution capillary Electrophoresis basic and theory Electrophoretic Techniques Classification Instrumentation Applications

<b>Planning</b>			
	Class hours	Hours outside the classroom	Total hours
Problem solving	26	26	52
Laboratory practices	45.5	7	52.5
Lecturing	26	26	52
Practices report	0	38	38
Short answer tests	3.55	12.9575	16.5075
Essay questions exam	3.5	10.5	14

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

<b>Methodologies</b>	
	Description
Problem solving	Following the master classes, seminars be dedicated to solving problems / exercises, which aims are to finding the comprehension level of the students on issues developed. The exercises will be develop in small groups in seminars session followed a general discussion, later the student will have individual proposes exercises to solve individually. The seminars are aimed at strengthening the knowledge acquired in the lectures class, Practical analytical issues and related to the content of the subject will be discussed.
Laboratory practices	The laboratory practical sessions have a fundamental part in the teaching of the subject. On the one hand, they are essential for understanding theoretical concepts; and also allows the students to introduce on analytical methodology practical concepts, as well to understand the norms and rules of scientific work, individual and work group concept in laboratory including report writing.
Lecturing	Lecture sessions will develop during 60 minutes. The teacher provides a global vision of each agenda item, stating the main contents of each. Classes are held interactive way with the students, using online learning materials (Tem @ platform) and adequate literature.

<b>Personalized attention</b>	
Methodologies	Description
Problem solving	
Laboratory practices	
Tests	Description
Practices report	

<b>Assessment</b>		Qualification	Training and Learning Results
	Description		
Problem solving	The teacher will monitor the exercises given to students in seminars class. Scientific publication, pratical situations will be discussed in seminars sessions and supervised by the teacher	10	C4 D1 C8 D6 C18 C29
Laboratory practices	The teacher will monitor the experimental work done by students in the lab sessions. It is REQUIRED to attend practical laboratory sessions to pass the course. Students who do not perform laboratory practices are considered FAIL throughout the cycle of evaluation of the course.	15	C20 D4 C21 D7 C25 D8 C26 D13 C27 C28
Practices report	The student will prepare lab reports, which reflects the work performed in the laboratory. These reports must be submitted by the deadline and will be corrected by the teacher.	10	C17 D1 C19 D4 C20 D6 C28 D7 C29 D14
Short answer tests	The theoretical/practical short test will be used during semester evaluation. This test is not eliminatory and will contribute 10% of the final grade for the course.  Labortory test for each student will be made to asses their skills in the development of an experiment. This test is performed at the end of the lab sessions and it contribute 10% to the final score.	20	C4 D1 C8 D3 C18 D6 C19 D7 C20 D9 C21 C25 C26 C27 C28 C29

Essay questions exam	The exam (the test) will be performed at the end of the semester and contains a theoretical and theoretical-practical aspects. For compensation of subject , students must achieve at least 4.0 minimum score (4.0 minimum score in each part of the test).	45	C4 C8 C17 C18 C19	D1 D3 D6 D9
ATTENTION: 3.0 is the minimal requirement in the final results achieve by the student for each long test corresponding to each teacher participate in the subject in order to carry out the weighting of overall examination. If you do not get this rating, the end result is FAIL				

### Other comments on the Evaluation

Omission of ALL activities proposed for the evaluation of the subject (Not participated all evaluation activities) for the evaluation of the subject will be considered as NOT PRESENTED (NO EVALUATION). Attendance at laboratory practices class is mandatory and eliminatory. If the participation in these activities is less than 80%, TOTAL results in subject evaluation will be FAIL (SUSPENSO); in this case, the final official result will be the value only obtained for laboratory evaluatio.

- July evaluation:

In the second evaluation, the same criteria than in the first one will be applied.

### Sources of information

#### Basic Bibliography

Douglas A. Skoog, F. James Holler, Stanley R. Crouch, **Principios de análisis instrumental**, 6ª, 2008

Satinder Ahuja, Neil D. Jespersen, **Modern instrumental analysis**, 1ª, Elsevier, 2006

James W. Robinson, Eileen M. Skelly Frame, George M. Frame, **Undergraduate instrumental analysis**, 7ª, CRC Press, 2014

#### Complementary Bibliography

Lucas Hernández Hernández, Claudio González Pérez, **Introducción al análisis instrumental**, 1ª, Ariel Barcelona, 2002

Donald T. Sawyer; William R. Heineman; Janice M. Beebe, **Chemistry Experiments for Instrumental Methods**, 1ª, Wiley, 1984

Rouessac, Annick Rouessac, **Chemical Analysis: Modern Instrumentation Methods and Techniques**, 6ª, John Wiley & Sons, 2007

### Recommendations

#### Subjects that continue the syllabus

Analytical chemistry 3/V11G200V01601

#### Subjects that are recommended to be taken simultaneously

Structural Determination/V11G200V01501

Chemical engineering/V11G200V01502

Organic chemistry II/V11G200V01504

#### Subjects that it is recommended to have taken before

Chemistry, physics and biology: Integrated laboratory 1/V11G200V01103

Chemistry, physics and geology: Integrated laboratory 2/V11G200V01202

Chemistry: Chemistry 1/V11G200V01105

Chemistry: Chemistry 2/V11G200V01204

Numerical methods in chemistry/V11G200V01402

Analytical chemistry 1/V11G200V01302