



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				
Coordinator	González Romero, Elisa Leao Martins, Jose Manuel			
Lecturers	González Romero, Elisa Leao Martins, Jose Manuel Pena Pereira, Francisco Javier			
E-mail	leao@uvigo.es eromero@uvigo.es			
Web	http://quimica.uvigo.es/decanatoquimica/guias-docentes.html			
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
Adavances 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		D17
	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

Planning			
	Class hours	Hours outside the classroom	Total hours
Problem solving	26	26	52
Laboratory practical	45.5	7	52.5
Lecturing	26	26	52
Report of practices, practicum and external practices	0	38	38
Problem and/or exercise solving	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.

Methodologies	
	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 practical	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 55 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.

Personalized assistance	
Methodologies	Description
Problem solving	The mentoring program is set up as a study support, where the student will have a personalized academic assistance in order to making better use of the training and knowledge in the subject. The students will have individual or group presencial tutorial sessions, this tutorial planning also can be supervised using electronic learning by Tem @ Platform (FAITIC) or by remote campus.
Laboratory practical	The mentoring program is set up as a study support, where the student will have a personalized academic assistance in order to making better use of the training and knowledge in the subject. The students will have individual or group presencial tutorial sessions, this tutorial planning also can be supervised using electronic learning by Tem @ Platform (FAITIC) or by remote campus.
Tests	Description
Report of practices, practicum and external practices	The mentoring program is set up as a study support, where the student will have a personalized academic assistance in order to making better use of the training and knowledge in the subject. The students will have individual or group presencial tutorial sessions, this tutorial planning also can be supervised using electronic learning by Tem @ Platform (FAITIC) or by remote campus.

Assessment				
	Description	Qualification	Training and Learning Results	
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 C8 C18 C29	D1 D6
Laboratory practical	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 C21 C25 C26 C27 C28	D4 D7 D8 D13
Report of practices, practicum and external practices	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 C19 C20 C28 C29	D1 D4 D6 D7 D14

Problem and/or exercise solving	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. Laboratory test for each student will be made to assess their skills in the development of an experiment. This test is performed at the end of the lab sessions and it contributes 10% to the final score.	20	C4 C8 C18 C19 C20 C21 C25 C26 C27 C28 C29	D1 D3 D6 D7 D9
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). ATTENTION: 3.0 is the minimal requirement in the final results achieved by the student for each long test corresponding to each teacher participating 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	45	C4 C8 C17 C18 C19	D1 D3 D6 D9

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 evaluation.

- July evaluation:

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

In the event that the tests are held in person, access to the classroom will not be allowed with any of the existing electronic devices (computer, tablet, mobile or mobile, etc.).

If the tests are carried out semi-face-to-face or telematically in virtual rooms, only the use of the computer (with camera and audio) will be allowed for the connection. Failing that, they will connect with the mobile to the remote campus. The rest of the devices must remain off and out of the student's reach, unless circumstances allow teachers to allow it.

Note: the teachers of the subject do not allow to be recorded, neither by videos nor by audios or any other format such as screenshots, during the development of face-to-face or telematic classes. What is communicated for the appropriate purposes to all attendees.

Note2: Virtual attendance can be controlled; Consequently, it will be considered not presented, NP, not attending 25% of the contact hours and / or they have not been virtually connected (virtual attendance), in addition to not having performed any of the tests (short or long) or having participated in scheduled activities.

Note3: If the connection allows it, the theoretical part of any of the tests that remain to be done can be oral.

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

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in advance) by the students and teachers through the standardized tool.

=== ADAPTATION OF THE METHODOLOGIES ===

* Teaching methodologies maintained

* Teaching methodologies modified

* Non-attendance mechanisms for student attention (tutoring)

* Modifications (if applicable) of the contents

* Additional bibliography to facilitate self-learning

* Other modifications

=== ADAPTATION OF THE TESTS ===

* Tests already carried out

Test XX: [Previous Weight 00%] [Proposed Weight 00%]

...

* Pending tests that are maintained

Test XX: [Previous Weight 00%] [Proposed Weight 00%]

...

* Tests that are modified

[Previous test] => [New test]

* New tests

* Additional Information

Methodology

All those described in the Teaching Guide are maintained and use will be made of the virtual classrooms of the Faculty of Chemistry, in combination with the Faitic, Moodle and Skype platforms (if necessary), including communication by email, for performance of said methodologies.

Bibliography

Those described in the Guide are kept and supplementary material will be posted on Faitic (documents and links) to facilitate access to information.

Evaluation

All evaluable activities are maintained in the same way, including the short test and the scheduled ordinary and extraordinary exams, which will be carried out through the Faitic and / or Moodle platforms, the dates of which will be included in the 2020-2021 course schedule.

If the tests are carried out semi-face-to-face or telematically in virtual rooms, only the use of the computer (with camera and audio) will be allowed for the connection. Failing that, they will connect with the mobile to the remote campus. The rest of

the devices must remain off and out of the student's reach, unless circumstances allow teachers to allow it.

Note: the teachers of the subject do not allow to be recorded, neither by videos nor by audios or any other format such as screenshots, during the development of face-to-face or telematic classes. What is communicated for the appropriate purposes to all attendees.

The qualifications and the revision date will be also communicated by Fatic. The revision, at a personalized time for each student, will be done in the faculty rooms of the remote campus.
