



## Teaching Guide

| Teaching Guide      |                                                                                                                                                                                                                                                                                   |        |                      |           |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|----------------------|-----------|
| Identifying Data    |                                                                                                                                                                                                                                                                                   |        |                      | 2022/23   |
| Subject (*)         | Analytical Chemistry 2                                                                                                                                                                                                                                                            |        | Code                 | 610G01012 |
| Study programme     | Grao en Química                                                                                                                                                                                                                                                                   |        |                      |           |
| Descriptors         |                                                                                                                                                                                                                                                                                   |        |                      |           |
| Cycle               | Period                                                                                                                                                                                                                                                                            | Year   | Type                 | Credits   |
| Graduate            | 2nd four-month period                                                                                                                                                                                                                                                             | Second | Obligatory           | 6         |
| Language            | Spanish                                                                                                                                                                                                                                                                           |        |                      |           |
| Teaching method     | Face-to-face                                                                                                                                                                                                                                                                      |        |                      |           |
| Prerequisites       |                                                                                                                                                                                                                                                                                   |        |                      |           |
| Department          | Química                                                                                                                                                                                                                                                                           |        |                      |           |
| Coordinador         | Turnes Carou, Maria Isabel                                                                                                                                                                                                                                                        | E-mail | isabel.turnes@udc.es |           |
| Lecturers           | Moreda Piñeiro, Jorge                                                                                                                                                                                                                                                             | E-mail | jorge.moreda@udc.es  |           |
|                     | Turnes Carou, Maria Isabel                                                                                                                                                                                                                                                        |        | isabel.turnes@udc.es |           |
| Web                 |                                                                                                                                                                                                                                                                                   |        |                      |           |
| General description | The aim of this subject is the study of the sampling strategies, sample pre-treatment and treatment methodologies and separations techniques. Basic fundamentals of electroanalytical techniques (conductometry and potentiometry) are also enclosed in the scope of this subject |        |                      |           |

## Study programme competences

| Code | Study programme competences                                                                                                        |
|------|------------------------------------------------------------------------------------------------------------------------------------|
| A7   | Knowledge and application of analytical methods                                                                                    |
| A15  | Ability to recognise and analyse new problems and develop solution strategies                                                      |
| 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)                                        |
| A18  | Risk management in relation to use of chemical substances and laboratory procedures                                                |
| 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                                                         |
| A22  | Ability to plan, design and develop projects and experiments                                                                       |
| A23  | Critical standards of excellence in experimental technique and analysis                                                            |
| A24  | Ability to explain chemical processes and phenomena clearly and simply                                                             |
| A25  | Ability to recognise and analyse link between chemistry and other disciplines, and presence of chemical processes in everyday life |
| B2   | Effective problem solving                                                                                                          |
| B3   | Application of logical, critical, creative thinking                                                                                |
| B4   | Working independently on own initiative                                                                                            |
| 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                               |
| C8   | Understanding role of research, innovation and technology in socio-economic and cultural development                               |

## Learning outcomes

| Learning outcomes                                                                           | Study programme competences |    |    |
|---------------------------------------------------------------------------------------------|-----------------------------|----|----|
| Knowledge and application of Sampling techniques and preparation of sample to the analysis. | A7                          | B2 | C1 |
|                                                                                             | A16                         | B3 | C6 |
| Application of main separation techniques                                                   | A7                          | B2 | C1 |
|                                                                                             | A15                         | B3 | C6 |
|                                                                                             | A21                         |    |    |



|                                                                                    |                                        |    |          |
|------------------------------------------------------------------------------------|----------------------------------------|----|----------|
| To acquire the basic skill in the laboratory of Analytical Chemistry               | A17<br>A18<br>A19<br>A20<br>A22<br>A23 | B4 | C1<br>C6 |
| Ability to explain phenomena and processes related to Analytical Chemistry clearly | A7<br>A24<br>A25                       | B3 | C1<br>C8 |

| Contents                                      |                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic                                         | Sub-topic                                                                                                                                                                                                                                                                                                                                                                                |
| Sampling techniques and preparation of sample | Sampling theory and methodology<br>Sample pretreatment<br>Sample preparation methods                                                                                                                                                                                                                                                                                                     |
| Separation techniques                         | Precipitation<br>Distillation<br>Extraction<br>ionic exchange<br>Clasical electrophoresis<br>Chromatography                                                                                                                                                                                                                                                                              |
| Electroanalytical techniques                  | Conductometry<br>Potentiometry                                                                                                                                                                                                                                                                                                                                                           |
| Laboratory experiments                        | Preparation of mussels samples for metal analysis<br>Determination of fat content in food<br>Concentration of trace elements in water by ion exchange<br>Extraction of caffeine from beverages<br>Separation of plant pigments by thin layer chromatography<br>Conductimetric titrations: composition of strong and weak acids mixture. determination of acetylsalicylic acid in Aspirin |

| Planning                        |                                                         |                      |                               |             |
|---------------------------------|---------------------------------------------------------|----------------------|-------------------------------|-------------|
| Methodologies / tests           | Competencies                                            | Ordinary class hours | Student?s personal work hours | Total hours |
| Laboratory practice             | A7 A15 A17 A18 A19<br>A20 A22 A23 A24 B2<br>B3 B4 C6 C8 | 20                   | 20                            | 40          |
| Seminar                         | A7 A15 A20 A21 A22<br>A24 A25 B2 B4 C1                  | 8                    | 20                            | 28          |
| Guest lecture / keynote speech  | A7 A16 A21 A22 A24<br>A25 B3                            | 24                   | 54.48                         | 78.48       |
| Mixed objective/subjective test | A7 A15 A20 A24 B2<br>B3 B4 C1                           | 3                    | 0                             | 3           |
| Personalized attention          |                                                         | 0.52                 | 0                             | 0.52        |

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

| Methodologies |             |
|---------------|-------------|
| Methodologies | Description |



|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Laboratory practice             | <p>In the laboratory sessions students will carry out the application of the theoretical concepts studied in the classroom. The scripts will have questions that the students will have to answer and deliver once finished the practices.</p> <p>During laboratory sessions, and on a simultaneous way to the realisation of the experiments, the student will have to elaborate a diary 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.</p> |
| Seminar                         | <p>On site activities for small to very small groups in which the students must participate actively. Seminars will be mostly devoted to solve examples of real problems and numerical exercises. The problems are discussed and solved by the students following the guidance of the instructor.</p>                                                                                                                                                                                                                                                                                 |
| Guest lecture / keynote speech  | <p>The teacher will present the fundamental contents of each of the topics. For better learning, students will have to advance the development of these sessions teaching materials suitable for your personal preparation.</p>                                                                                                                                                                                                                                                                                                                                                       |
| Mixed objective/subjective test | <p>The test to evaluate the knowledge gained by the student will include both theoretical and numerical questions.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

## Personalized attention

| Methodologies                  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Seminar<br>Laboratory practice | <p>The work developed by students in seminars and laboratory practice involves personal attention from the teacher both in the resolution of questions as a guide to the preparation thereof, correction questionnaires, understanding fault indication etc.</p> <p>In addition, Professor mention to the student individually to discuss in more depth how their learning progress of matter.</p> <p>Moreover, all students can consult the teacher any aspect of the subject in the tutorial schedule established for this purpose.</p> <p>Students being recognized officially as partial-time and entitled not to attend the lectures will be attended in a tutorships regime (set hour with teacher in advance).</p> |

## Assessment

| Methodologies                   | Competencies                                      | Description                                                                                                                                                                                                                                                                 | Qualification |
|---------------------------------|---------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Seminar                         | A7 A15 A20 A21 A22 A24 A25 B2 B4 C1               | It will assess the student's participation, the resolution of problems and numerical exercises, compliance dates for delivery or revision. Some short tests will be done periodically in the seminar sessions and /or guest lecture to assess the evolution of the student. | 20            |
| Laboratory practice             | A7 A15 A17 A18 A19 A20 A22 A23 A24 B2 B3 B4 C6 C8 | It will assess the performance of questions, abilities and skills of students in the experimental work, their ability to interpret the results, etc.                                                                                                                        | 20            |
| Mixed objective/subjective test | A7 A15 A20 A24 B2 B3 B4 C1                        | It will assess the student's ability to express, summarize and develop theoretical aspects of the subject and the resolution of problems and numerical exercises.                                                                                                           | 60            |

## Assessment comments



To pass the subject three basic requirements are needed:

1.-The laboratory sessions are mandatory.

2.-Reach a minimum qualification of 5 over 10 in the laboratory practice and in each mixed test.

3. Students who do not participate on the problem solving and do not carry out the short answer questions will score 0 in these sections (20%).

-In the first and second time, students who not reach 5 points in practices evaluation, have the opportunity to, in addition to the mixed test, perform a specific test related to the labs. The score of this test specifically replaced the grade obtained in practice for the overall rating.

The student will obtain the qualification of No Presented when the student does not assist to laboratory sessions and to the final mixed exam.

In the evaluation of the subject, all that is established in article 14, regarding the Fraud Commission and disciplinary responsibilities, of the UDC's Rules for the Evaluation of Degrees and Master's Degrees, will be applied.

In the context of "continuous evaluation" the "second opportunity of July" is a second opportunity of realisation of the mixed test. Therefore, the laboratory practice, and seminars, will keep the qualifications obtained along the course, whereas the qualification of the mixed test of second opportunity will substitute to the one obtained in the mixed test of the first opportunity.

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 its whole in the "first opportunity".

- For students with recognition of dedication and part-time academic exemption waiver assistance, conducting laboratory practices are mandatory and it will be provided within the flexibility to allow coordinating schedules and material and human resources. They shall be deemed exempt from the keynote sessions while assistance will be provided to the greatest number of seminars. Therefore, these students will be evaluated by the grades obtained in laboratory practices (20%), in the mixed test (60%) and in the activities of the seminars (20%). If they can not attend the seminars will make a mentored work.

For those students who apply for the advance assessment in December, the considerations indicated in the teaching guide for the previous year will be applied.

## Sources of information

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Basic</b>         | <ul style="list-style-type: none"> <li>- CÁMARA, C.; FERNÁNDEZ, P.; MARTÍN-ESTEBAN, A; PÉREZ-CONDE, C.; MIQUEL VIDAL (2002). Toma y Tratamiento de Muestra. Madrid, Ed. Síntesis</li> <li>- SKOOG, D.; WEST, D.N.; HOLLER, F.J.; CROUCH, S.R. (2005). Fundamentos de Química Analítica. Madrid, Ed. Thomsom, 8ª edición</li> <li>- HARRIS DANIEL C (2007). Análisis Químico Cuantitativo. Barcelona, Ed. Reverté, 3ª Edición</li> </ul> |
| <b>Complementary</b> | <ul style="list-style-type: none"> <li>- VALCARCEL, M. &amp; GÓMEZ, A. (1988). Técnicas Analíticas de Separación. Barcelona, Ed. Reverté</li> <li>- HARVEY, D. (2002). Química Analítica Moderna. Madrid, Ed. McGraw-Hill</li> <li>- GAVIRA VALLEJO, J.M. HERNANZ GISMERO, A. (2007). Técnicas Físicoquímicas en Medio Ambiente. Madrid, Ed. Librería UNED</li> </ul>                                                                   |

## Recommendations

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

General Chemistry 3/610G01009

Analytical Chemistry 1/610G01011

### Subjects that are recommended to be taken simultaneously

Chemistry Laboratory 2/610G01032

### Subjects that continue the syllabus

Instrumental Analytical Chemistry 1/610G01013

Instrumental Analytical Chemistry 2/610G01014

### Other comments



(\*)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.