

## 30805 - Key techniques for chemical analysis

### Información del Plan Docente

Academic Year	2017/18
Faculty / School	105 - Facultad de Veterinaria
Degree	568 - Degree in Food Science and Technology
ECTS	6.0
Year	1
Semester	Second semester
Subject Type	Basic Education
Module	---

### 1.General information

#### 1.1.Introduction

#### 1.2.Recommendations to take this course

#### 1.3.Context and importance of this course in the degree

#### 1.4.Activities and key dates

### 2.Learning goals

#### 2.1.Learning goals

#### 2.2.Importance of learning goals

### 3.Aims of the course and competences

#### 3.1.Aims of the course

#### 3.2.Competences

### 4.Assessment (1st and 2nd call)

#### 4.1.Assessment tasks (description of tasks, marking system and assessment criteria)

### 5.Methodology, learning tasks, syllabus and resources

#### 5.1.Methodological overview

The learning process that is designed for this subject is based on ...

- **40 hours of interactive lecture class:** the contents of each issue are discussed alternating theory with examples, issues and problems.
- **5 hours of seminars:** there are 5 sessions of 1 hour. The group is divided into 2 subgroups. Problems, doubts and applied exercises will be solved.

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- **15 hours of laboratory session:** the practice group is divided into 5 teams. There are 5 different practices of 3 hours.
- **8 hours of supervisal practical group.** The students prepare and present a practice to the rest of the group.

### 5.2.Learning tasks

The course is divided into 6 blocks. The activities are...

#### Block I

**Teaching-learning activities:** (0,8 ECTS)

**Lectures:** 7 hours

**Seminar:** 1 hour

**Student work:** 11 hours of study and 1 hour to solve a self-evaluative test.

#### Block II

**Teaching-learning activities:** (0,5 ECTS)

**Lectures:** 4 hours

**Seminar:** 1 hour

**Student work:** 6,5 hours.

#### Block III

**Teaching-learning activities:** (0,9 ECTS)

**Lectures:** 8 hours

**Seminar:** 1 hour

**Student work:** 12,5 hours of study and 20 minutes to solve a self-evaluative test

#### Block IV

**Teaching-learning activities:** (1,4 ECTS)

**Lectures:** 13 hours

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**Seminar: 1 hour**

**Student work:** 20 hours of study and 20 minutes to solve a self-evaluative test,

**Block IV**

**Teaching-learning activities:** (1,5 ECTS)

**Practice: 15 hours**

**Student work:** 7,5 hours of study and 8 hours of supervised work

### 5.3.Syllabus

#### **BLOCK I. Introduction.**

Unit 1. Objectives of the Analytical Chemistry.

Analytical process. Analytical signals. Calibration. Calibration line. Sensitivity. Linear response range. Detection limit. Noise

#### **BLOCK II. Electroanalytical techniques.**

Unit 2. Potentiometry.

Introduction to electroanalytical techniques. Classification. Potentiometry. Instrumentation. Electrodes. Applications. Potentiometric titrations.

#### **BLOCK III. Chromatographic techniques.**

Unit 3. Introduction to chromatography.

Classification. Column chromatography. Analytical signal: the chromatogram. Parameters: a.- dead time ( $t_m$ ) b.- retention time ( $t_r$ ) c.- capacity factor. d.- selectivity factor. e. chromatographic peak width. Efficiency. f. Resolution. Optimization techniques. The general problem of elution. The chromatograph. Qualitative and quantitative information. Calibration: Internal standard.

Unit 4. Gas chromatography. GC principles. The chromatograph. Columns. Injector. Carrier gas. Injection modes. Detector. Oven. Applications. Methodology

Unit 5. High performance liquid chromatography. Pumps. Sample injection systems. Chromatographic columns. Detectors. Separation modes. Applications.

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### **BLOCK IV. Molecular spectrometric techniques.**

Unit 6. Introduction to optical analysis techniques.

Structure of matter. Energy electromagnetic radiation. Interactions. Classification. Analytical signal. Spectra. Information.

Unit 7. Molecular absorption spectrometry in the UV-Visible.

Parameters and information. Lambert-Beer law. Molecules. Instrumentation. Applications. Quantitative aspects. Deviations from the Beer-Lambert law. Methodology. Other applications: qualitative and photometric ratings.

Unit 8. Molecular Luminescence. Photoluminescence: fluorescence and phosphorescence. Fluorescent process. Parameters and information. Fluorescent molecules. Instrumentation. Relationship between intensity and concentration. Applications.

Unit 9. Molecular absorption spectrometry in the infrared. Introduction. Parameters and Information. IR spectrum. Instrumentation. Applications

### **BLOCK V. Atomic spectrometric techniques.**

Unit 10. Spectrometry flame atomic absorption

Introduction. Parameter measurement. Information. Instrumentation. Radiation sources. Sample compartment: flame. Types of instruments. Applications. Quantitative aspects. Absorbance-concentration relationship. Interferences. Work Methodology Applications

Unit 11. Atomic emission spectrometry flame

Emission spectra flame photometry. Instrumentation. Quantitative applications. Intensity and concentration ratio. Interferences. Analytical methodology. Applications.

### **BLOCK VI. Laboratory practices**

Practice 1 Molecular absorption spectrometry UV-Visible. Determination of phosphate in a cola drink. Choosing conditions.

Practice 2 Atomic Absorption Spectrometry. Determination of copper in wine. Choice of conditions and parameters study. Calibration curve and standard addition.

Practice 3 High-resolution liquid chromatography. Qualitative determination of additives in a cola

drink. Study parameters.

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Practice 4 Gas Chromatography. Determination of alcoholic grade. Study of parameters.

Practice 5 Potentiometry. Determination of chloride in samples. Study of parameters.

### 5.4.Course planning and calendar

[http://veterinaria.unizar.es/gradocta/horarios1.php?COD\\_TITULACION=5](http://veterinaria.unizar.es/gradocta/horarios1.php?COD_TITULACION=5)

### 5.5.Bibliography and recommended resources

**BB**

Harris, Daniel C. : Análisis químico  
cuantitativo / Daniel C. Harris . 3ª ed.  
Barcelona [etc.] : Reverté, cop. 2007

**BB**

Skoog, Douglas A.. Fundamentos de  
química analítica / Douglas A. Skoog ... [et  
al.] . 8ª ed. Australia, Madrid [etc.] :  
Thomson, D.L. 2005

All the material of the course is in <http://moodle2.unizar.es> .