SEQA
Sociedad Española de Química Analítica

Mesa redonda:

Actualización de los contenidos del "Core Chemistry" en Química Analítica - Eurobachelor® label

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INTRODUCTION

Laboratory Practice

Industrial Employability

Research Data management (RDM), Data Science

Sustainability and ethical issues, chemistry and society

Presentation Skills

Digital Support for teaching and learning

Bachelor Degree - competences

Core Chemistry Areas

- General Chemistry
- Physical Chemistry
- Inorganic Chemistry
- Organic Chemistry
- **Analytical Chemistry**
- Biological Chemistry
- Experimental Chemistry (Laboratory Practices)

ANALYTICAL CHEMISTRY

SPECIFIC DOMAIN:

Overall Analytical Process: basic idea, objectives and basic terms

TOPICS:

Analytical problem: from sampling to evaluation

DETAILS:

Object under investigation, analysis principle, methods of analysis, experiment and evaluation, dealing with small amounts of samples, concentration ranges, validation, quality assurance

COMPETENCES/LEARNING OUTCOMES

To acquire basic knowledge and skills in analytical chemistry and ability to work independently on analytical questions with the problem-oriented selection of suitable methods

To acquire basic knowledge on how to validate an analytical method

ANALYTICAL CHEMISTRY

SPECIFIC DOMAIN:

Analytical methods of determination

TOPICS:

Sampling and sample treatment

DETAILS:

Sampling strategies. Theory of sampling. Examples of international guidelines. Sample reduction and sample preparation for gases, liquids and solids

COMPETENCES/LEARNING OUTCOMES

To acquire basic knowledge on the different approaches to get a sample (being it gas, solid or liquid). To acquire basic knowledge on the statistical theory of sampling. Ability to choose and apply a sample strategy. Ability to get a subsample and how to treat it

ANALYTICAL CHEMISTRY

SPECIFIC DOMAIN:

Analytical methods of determination

TOPICS:

Separation based analytical methods and enrichment processes

DETAILS:

Fundamentals of compounds separation (gases, liquids and solids). Concept of affinity. Principles governing the separation of compounds. Digestion, extraction, enrichment processes, matrix effects, chromatography (GC, HPLC, TLC, electrophoresis)

COMPETENCES/LEARNING OUTCOMES

Ability to choose and apply adequate separation-based experimental methods and interpret the results. Ability to preconcentrate and/or separate an analyte (several) of interest from the main sample matrix

ANALYTICAL CHEMISTRY

SPECIFIC DOMAIN:

Analytical methods of determination

TOPICS:

Determination Analytical Methods

DETAILS:

Gravimetry, titrimetry, surface analysis, electrochemical analytical methods (potentiometry, electrogravimetry, coulometry, voltammetry, conductimetry), atomic spectroscopy (AAS, AES, ICP), molecular spectroscopy (UV-VIS, fluorescence, IR, Raman), mass spectrometry [structure, ionization, fragmentation, detection, coupling techniques: (LA) ICP-MS, (D)ESI-MS, GC-MS, HPLC-MS]. Sensors and biosensors. Automation and miniaturization

COMPETENCES/LEARNING OUTCOMES

To know the fundamentals, applicability and limitations of analytical methods of determination.

Ability to use the different techniques. Ability to forsee how to streamline an analytical method

ANALYTICAL CHEMISTRY

SPECIFIC DOMAIN:

Analytical methods of determination

TOPICS:

Performance analytics parameters

DETAILS:

Sensitivity, limit of detection, limit of quantification, uncertainty, robustness, selectivity/specificity, trueness and precision (repeatability and reproducibility), false positive and false negative, resolution, signal types, noise

COMPETENCES/LEARNING OUTCOMES

Understand the potential and limitations of different methods. Ability to calculate critical performance parameters of analytical methods

ANALYTICAL CHEMISTRY

SPECIFIC DOMAIN:

Chemometrics

TOPICS:

Design of experiments, univariate and basic multivariate chemometrics

DETAILS:

Design of experiments: sequential optimization, factorial designs. Statistical evaluation of data, data analysis, calibration methods, least squares adjustment, linear regression, confidence intervals, study of the regression line, principal component analysis, basic pattern recognition, classification

COMPETENCES/LEARNING OUTCOMES

Design experiments, evaluate and interpret results

Ability to perform statistical analysis of univariate results. Ability to perform basic pattern recognition of experimental data

ANALYTICAL CHEMISTRY COMPETENCES

Analytical Skills:	Ability to use the different analytical techniques to detect and determine compounds. Ability to establish critical performance parameters.
Problem-Solving:	Design analytical protocols for detection and determination of compounds. Provide problem-oriented selection of suitable analytical methods.
Practical Laboratory Skills:	Proficiency in safely conducting laboratory experiments involving experimental techniques and compound analysis. Competences in sampling strategies, compound separation and enrichment processes.
Interdisciplinary Awareness:	Connect analytical chemistry concepts with their applications in biological and environmental systems, etc.
Communication and Collaboration:	Report findings accurately and collaborate effectively in research or industrial teams focusing on analytical chemical solutions.