27107 - Instrumental Techniques in Biotechnology

Información del Plan Docente

Academic Year	2016/17
Academic center	100 - Facultad de Ciencias
Degree	446 - Degree in Biotechnology
ECTS	9.0
Course	2
Period	Annual
Subject Type	Compulsory
Module	---

1.Basic info

1.1.Recommendations to take this course

1.2.Activities and key dates for the course

The distribution of the practices assigned to each area involved in teaching will be done considering that the theoretical basis for understanding the processes that are to be analyzed will have been explained in the first quarter or will be studying at the same time in the annual subject of Biochemistry and Molecular Biology. During the first quarter, the practices assigned to the area of Analytical Chemistry and practices of carbohydrates, lipids and nucleic acids assigned to the area of Biochemistry and Molecular Biology will be developed. In the second quarter, the practices concerning the purification and characterization of proteins, also assigned to the area of Biochemistry and Molecular Biology, will be developed

For students enrolled in the subject, places, times and dates of lectures and practical sessions will be public via Bulletin Board advertisements of the grade on the platform Moodle at the University of Zaragoza, https://moodle2.unizar.es/add/, and in the moodle page for the course. These routes will be also used to communicate enrolled students their distribution by groups of practical sessions, which will be organized by the coordination of degree. Provisional dates will be available on the website of the Faculty of Sciences in the corresponding section of the Degree in Biotechnology: https://ciencias.unizar.es/grado-en-biotecnologia.

In this web there will be also available the dates of exams.

2.Initiation

2.1.Learning outcomes that define the subject

2.2.Introduction

3.Context and competences

3.1.Goals

3.2.Context and meaning of the subject in the degree

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3.3.Competences

3.4.Importance of learning outcomes

4.Evaluation

5.Activities and resources

5.1.General methodological presentation

5.2.Learning activities

5.3.Program

The program will be developed in 19 practice sessions (4 hours each), plus a seminar session of two hours and two sessions of presentation and discussion of results (4 hours each).

AREA OF ANALYTICAL CHEMISTRY

Session 1. Laboratory safety. Concentration of a solution. pH measurement, buffers and buffer power.

Session 2. Application of UV-visible spectroscopy to biomolecule quantification. Beer-Lambert law and extinction coefficient. Measurement of iron concentration by complexing with thiocyanate

Session 3. Principles of molecular fluorescence. Structural studies on proteins and monitoring of enzymatic reactions.

Seminar. Statistical treatment of quantitative results obtained in the laboratory.

AREA OF BIOCHEMISTRY AND MOLECULAR BIOLOGY

Session 1. General Theory of lipids. Extraction of total lipids by the Folch method.

Session 2. Thin layer chromatography applied to the separation of lipids. Preparation of fatty acids methyl esters.

Session 3. Thin layer chromatography of phospholipids. Introduction to gas chromatography. Data interpretation of gas chromatograms of methyl esters.

Session 4. Glycoproteins separation by affinity chromatography. Characterization by double immunodiffusion of the separated fractions (Ouchterlony).

Session 5. Neuraminidase treatment: electrophoresis analysis.

Session 6. Determination and characterization of sugars in a sample.

Session 7. Preparation, interpretation, presentation and discussion of results obtained in sessions 1-6.

Session 8. Nucleic acids preparation.

Session 9. Separation of nucleic acids by agarose gel electrophoresis. Nucleic acids detection and quantification. Assessment of the purity of the preparation.

Session 10. Introduction to protein purification. Isolation and characterization of proteins. Homogenization of tissues or cells. Enrichment by fractional precipitation.

Session 11. Dialysis and preparation of columns for the separation of proteins by ion exchange and affinity chromatographies.

Session 12. Protein separation by column chromatography. Protein quantitation by spectroscopic methods. Purity criteria.

Session 13. Determination of specific enzyme activity throughout the various purification steps of an enzyme.

Session 14. Quantitation of total protein by the method of Bradford. Determination of purification yield and yield.

Session 15. Determination of the kinetic parameters of an enzyme: Km and kcat.

Session 16. Denaturing electrophoresis on polyacrylamide gels (PAGE). Electroblotting: theoretical introduction and preparation of gels

Session 17. A) Electrophoresis applied to samples taken at different steps of purification as a criterion of purity and molecular weight determination. B) Electroblotting to PVDF membranes: sample preparation for sequencing the N-terminus.

Session 18. Data analysis from protein purification and characterization sessions (computer room).

Session 19. Presentation of the results obtained in the purification and characterization of proteins processes (sessions 10-18), class discussion and resolution of issues.

5.4.Planning and scheduling

For each of the sessions in the various areas students will be divided into 4-5 groups depending on the needs of each practice and the availability of laboratories. The sessions will take place in the morning, from 9 to 13h.

Schedules of lectures and problems will coincide with the officially established and will be available at: https://ciencias.unizar.es/grado-en-biotecnologia.

The places, calendar and groups for training and practical sessions will be established in coordination with the rest of maters at beginning of course. The Coordinator will produce the groups of students for these activities at beginning of course to avoid overlaps with other subjects.

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5.5.Bibliography and recomended resources