UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Biochemistry Practical Course

2627-2-E0202Q052-E0202Q05201

Aims

The course aims to provide students with both theoretical and practical knowledge for the application of experimental methodologies in biochemistry and cellular biochemistry. In particular, students will carry out various types of experiments in the field of cellular biochemistry, gaining the ability to work under sterile conditions with different mammalian cell models and to analyse their behaviour under different experimental conditions as well as in enzymatic biochemistry, through the determination of kinetic constants on purified enzyme. The experimental activities will be accompanied by foundational concepts in the processing and analysis of the experimental data collected during the practical course.

Knowledge and understanding. To consolidate and deepen basic knowledge of theoretical, technical and methodological issues already presented by the course of biochemistry.

Applying knowledge and understanding. To be able to correctly interpret the experimental protocols of biochemistry and cellular biochemistry, recognize their salient aspects, collect and process experimental data.

Making judgments. To develop a critical vision of the experimental design and of the results achieved. To be able to recognize the context for appropriate application of the experimental procedures methods learned during the course.

Communication skills. To be able to elaborate experimental data and describe the results in an appropriate language and with the correct technical terms.

Learning skills. To be able to correctly interpret experimental protocols in contexts different from those used during the practical laboratory experience.

Contents

1. Manipulation and propagation of mammalian cells in vitro;
2. Aseptic techniques for the protection of the operator, the cell culture and the environment;
3. Cell growth curves and in vitro doubling time;
4. Protein quantization by spectrophotometric assay;
5. Analysis of enzymatic activity by spectrophotometric assay;
6. Determination of kinetic constants using spectrophotometric assays;
7. Protein localization analysis by fluorescence microscopy;
8. Protein expression analysis by western blot;
9. Protein expression by fluorometric analysis;
10. Analysis of cell viability by spectrophotometric assay.
11. Analysis and critical discussion of the results obtained from the use of the above techniques.

Detailed program

1. Manipulation and propagation of murine and human cells;
2. Aseptic techniques to protect the operator, cell cultures, and the environment. In particular students will be instructed in the use of a sterile biological safety cabinet, sterile materials, and the behaviours necessary to maintain sterility;
3. Analysis of mammalian cell growth curves and in vitro doubling time under different growth conditions;
4. Protein quantification using a spectrophotometric assay. Specifically, students will assess the protein concentration of a cell extract using the Bradford method;
5. Enzymatic activity analysis using a spectrophotometric assay. Students will measure the enzymatic activity of an enzyme and determine its kinetic parameters;
6. Protein expression analysis using fluorescence microscopy. Students will analyse the expression of Green Fluorescent Protein (GFP) in a mammalian cell model;
7. Protein expression analysis using Western blot. Students will carry out the full procedure to analyse GFP expression in a mammalian cell line;
8. Cell viability analysis using the MTT spectrophotometric assay;
9. Critical analysis of the results obtained using the above-mentioned techniques.

Prerequisites

Background: participation in the Biochemistry course.
Specific prerequisites: none
General prerequisites: Students can take the exams of the second year after passing the examinations of Introductory Biology, General and inorganic Chemistry, Mathematics, and Foreign Language.

Teaching form

Each learning unit is addressed to a group of 35-40 students, through practical lessons by interactive teaching (IT) which are carried out in a dedicated teaching laboratory. At the beginning of each lesson, theory, aims and experimental design will be exposed. At the end of each experimental part , an overall discussion of collected results will take place in the same laboratory. For further details, please, refer to lesson calendar on the website of Biotechnology course. Attendance at the laboratory is mandatory.
Teaching language: italian.

Textbook and teaching resource

Learning material (slides of introductory lessons, handout, experimental data) is available at the e-learning platform of LTA-Biochemistry module.

Semester

Second semester

Assessment method

Closed-Answer Test and Open-Ended Questions

The final assessment is expressed as a mark out of 30.

The examination takes place in person in computerized mode, through access to the University e-learning platform. The overall duration of the examination is 1 hour and 30 minutes.

The examination consists of a test including:

20 multiple-choice questions;
2 open-ended questions, requiring an articulated and detailed answer in the form of a short essay.

Both the multiple-choice questions and the open-ended questions are aimed at assessing the student's preparation on both the theoretical and practical aspects covered during the course.

The topics included in the examination refer to the contents addressed during the lectures, the practical activities carried out, and the teaching material made available to students on the e-learning platform. These contents will also be reviewed, discussed, and further explored during the teaching laboratory activities.

The final mark will be determined on the basis of the correctness of the answers to the multiple-choice questions and the quality of the open-ended answers, which will be assessed in terms of completeness, clarity of expression, ability to connect theoretical and practical concepts, and appropriate use of scientific language.

The 20 multiple-choice questions will contribute up to a maximum of 20 points, with 1 point awarded for each correct answer, while each open-ended question will be assessed up to a maximum of 5 points, for an overall total of 30 points.

Office hours

Contact: on demand, upon request by mail to course's professors.

Sustainable Development Goals

GOOD HEALTH AND WELL-BEING | QUALITY EDUCATION