



Course syllabus

Faculty of Health and Life Sciences

Department of Chemistry and Biomedical Sciences

1BL008 Cell- och molekylärbiologi med laboratoriemetodik, 15 högskolepoäng

1BL008 Cell- and molecular biology with laboratory methodology, 15 credits

Main field of study

Biology, Biomedical Science, Biomedical Laboratory Science

Subject Group

Biomedical Laboratory Science

Level of classification

First Level

Progression

G1F

Date of Ratification

Approved 2009-06-09

Revised 2017-02-02 by Faculty of Health and Life Sciences.

The course syllabus is valid from spring semester 2017

Prerequisites

General Chemistry, 7.5 credits; Fundamental Laboratory Methodology, 7.5 credits; Biochemistry, 7.5 credits; Biochemical laboratory methodology, 7.5 credits; or the equivalent.

Objectives

Module 1: Cell and molecular biology – theory, 7.5 credits

After completing the module, the student should be able to:

- describe the structure and function of the eukaryotic mammalian cell and its organelles
- describe the composition of cell membranes and explain the transport mechanisms that regulate transport into and out of the cell
- explain the cellular mechanisms that control protein targeting to different organelles and secretion from the cell
- present the different types of intercellular communication
- describe the main groups of intracellular and cell-surface receptors and explain the main features of the intracellular signaling systems activated by these

receptor groups

- describe the organisation of the genome and explain the mechanisms behind the most common types of DNA damage and their repair
- explain the overall mechanisms involved in gene expression regulation
- describe the structure and function of cell junctions, both between cells and between cells and the extracellular matrix in tissues
- describe the structure of the cytoskeleton and provide an overview of its regulation and function
- explain the different phases of the cell cycle and the cellular mechanisms that regulate transitions between these phases
- provide an overview of the phases of mitosis and meiosis and the structure and function of the spindle apparatus
- provide an overview of the cellular mechanisms that regulate apoptosis
- explain basic genetic concepts, describe the origin and consequences of mutations and chromosome abnormalities, and explain Mendelian genetics and its relationship to meiosis
- provide a general overview of the foundations of philosophy of science
- present a scientific article within the field of cellular and molecular biology, in speech and writing.

Module 2: Biomedical laboratory science – theory and laboratory work, 7.5 credits

After completing the module, the student should be able to:

- explain the principles of the light microscope, the inverted phase contrast microscope, and the fluorescence microscope
- use and describe the setup and maintenance of a cell incubator and a clean bench
- present the fundamentals of cell culture techniques
- describe and conduct cultivation of mammalian cells with proper sterile techniques
- present basic molecular biology methods for nucleic acid and protein analysis
- plan, conduct, and evaluate laboratory experiments using basic cell and molecular biology techniques, and present the results in written lab reports that are also presented orally.

Content

Module 1: Cell and molecular biology – theory, 7.5 credits

- The general morphology of the eukaryotic mammalian cell and the individual morphology and function of different cell types.
- The structure and function of cellular membranes.
- The structure, function, and regulation of transport proteins and ion channels.
- Organisation of the eukaryotic genome.
- The structure, function, and organisation of DNA.
- The structure and function of RNA.
- Cellular mechanisms of replication, transcription, and translation.
- Mutations and DNA damage repair mechanisms.
- Regulation of gene expression.
- Protein targeting.
- General principles of cellular communication.
- The structure, regulation, and function of cellular receptors.
- The structure, regulation, and function of intracellular signaling systems.
- The structure and function of the cytoskeleton.

- The structure and function of cell-cell and cell-matrix connections in tissues.
- The cell cycle and its regulation.
- Mitosis and meiosis.
- Basic genetics and chromosome abnormalities.
- The fundamentals of philosophy of science.
- Written and oral presentation of research articles in the field of cell and molecular biology.

Module 2: Biomedical laboratory science – theory and laboratory work, 7.5 credits

- Methods of sterilisation and structure, maintenance, and function of cell culture incubators, sterile benches, and light microscopes.
- Cell culture techniques and sterilisation techniques.
- Isotope techniques.
- Purification of DNA and RNA.
- PCR, RT-PCR, Northern blot, Southern blot.
- In situ hybridisation, cloning, microarray, and sequencing.
- Laboratory exercises illustrating basic cell and molecular biology techniques.
- Written and oral presentation of obtained laboratory results.

Type of Instruction

Instruction is delivered in the form of lectures, laboratory sessions, seminars, and group exercises. Participation in laboratory sessions, seminars, and specified lectures and group exercises is mandatory.

Examination

The course is assessed with the grades Fail (U), Pass (G) or Pass with Distinction (VG).

Module 1 is examined through a written exam and graded as "Pass with distinction," "Pass," or "Fail." To receive a passing grade on module 1, the student must have received this grade on a written and an oral presentation of a literature assignment, as well as on the written examination.

Module 2 is examined through a written exam and graded as "Pass with distinction," "Pass," or "Fail." Laboratory reports (presented in writing as well as orally) and the practical test are graded as "Pass with distinction," "Pass," or "Fail."

Each module is assigned one of the grades of Pass with distinction, Pass, or Fail, which are then combined to determine the final grade for the entire course.

The grading criteria for the grade of Pass are based on the course objectives (see above).

Resit examination is offered within six academic weeks. The number of attempts for the practical test may be limited to five.

Course Evaluation

During or shortly after the course, a course evaluation should be conducted. The result and analysis of the course evaluation should be promptly communicated to the students who have taken the course. Students who are taking the course when it is offered the next time should be informed of the result at the course introduction. The course evaluation is anonymous.

Required Reading and Additional Study Material

Module 1

Alberts et al. *Essential Cell Biology*. Garland Science, the latest edition.

Research articles

Module 2

Alberts et al. *Essential Cell Biology*. Garland Science, the latest edition.

Wilson, K. & Walker, J. *Principles and Techniques of Biochemistry and Molecular Biology*. Cambridge University. The latest edition.