

KB5006_Biokemi III

“The life and death of a protein”

Autumn 2020

All lectures are online via Zoom

Scope

Proteins are responsible for most activities in a cell. For example, they synthesise DNA, RNA, proteins and lipids, they facilitate the uptake of essential nutrients and ions, generate cellular energy and help the cell divide.

Proteins that fail to function, through genetic mutations, are the cause of a number of diseases. And protein-based drugs are often a solution to treat these diseases.

This course will provide a deeper understanding of proteins, by studying their life and ultimately their death. We will marvel at the birth of a protein on the ribosome, admire the complexities of its journey through the cell and be amazed at the intricacies of its folding and assembly into a functional unit. We will also explore how it functions to carry out biochemical processes. We will then investigate the way that a protein is degraded so that the cycle can be repeated. Along the way you will receive grounding in important methodologies to study proteins. The knowledge acquired will be used to understand the molecular basis for protein-based diseases. It will also be used to understand how protein-based drugs can be developed to treat these diseases.

Activities

The course will consist of 14 lectures and 3 laboratory practicals. There is also a literature assignment, where students will work in small groups to investigate a contemporary, front-line area of biochemical research. Details about these activities are described below.

Responsible for course

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Teachers

Daniel Daley (DD)

Einar Hallberg (EH)

Mikael Oliverberg (Mikael O)

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Assistants

James Cumming (JC)

Anastasia Magoulopoulou (AM)

Saman Hosseini-Ashtiani (SHA)

Suggested reading

- Lehninger: Principles of Biochemistry, 5th, 6th or 7th ed., Nelson & Cox
- Articles and handouts given by the lecturers

Course schedule

Week	Day	Date	Time							
			09:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00
36	Mon	31_Aug	Course Intro (DD) /Protein synthesis 1 (DD)				Work on literature assignment			
	Tues	01-Sep	Work on literature assignment				Work on literature assignment			
	Weds	02-Sep	Protein synthesis 2 (DD)				Work on literature assignment			
	Thurs	03-Sep	Work on literature assignment				Work on literature assignment			
	Fri	04-Sep	Protein trafficking 1 (DD)				Work on literature assignment			
37	Mon	07-Sep	Protein trafficking 2 (DD)				Work on literature assignment			
	Tues	08-Sep	Protein trafficking 3 (EH)				Work on literature assignment			
	Weds	09-Sep	Work on literature assignment				Work on literature assignment			
	Thurs	10-Sep	Protein trafficking 4 (EH)				Work on literature assignment			
	Fri	11-Sep	Protein folding (MO)				Work on literature assignment			
38	Mon	14-Sep	Protein assembly (DD)				Work on literature assignment			
	Tues	15-Sep	Molecular chaperones (EG)				Work on literature assignment			
	Weds	16-Sep	Work on literature assignment				Work on literature assignment			
	Thurs	17-Sep	Protein turnover (EG)				Work on literature assignment			
	Fri	18-Sep	Recombinant protein production (DD)				Work on literature assignment			
39	Mon	21-Sep	Protein structures 1 (MH)				Work on literature assignment			
	Tues	22-Sep	Lab practicals (see separate schedule)				Lab practicals (see separate schedule)			
	Weds	23-Sep	Protein structures 2 (MH)				Hand in group work assignment			
	Thurs	24-Sep	Protein biotechnology (DD)				Work on literature assignment			
	Fri	25-Sep	Work on literature assignment				Presentation of group work (DD)			
40	Mon	28-Sep	Lab practicals (see separate schedule)				Lab practicals (see separate schedule)			
	Tues	29-Sep	Lab practicals (see separate schedule)				Lab practicals (see separate schedule)			
	Weds	30-Sep	Lab practicals (see separate schedule)				Lab practicals (see separate schedule)			
	Thurs	01-Oct	Lab practicals (see separate schedule)				Lab practicals (see separate schedule)			
	Fri	02-Oct	Lab practicals (see separate schedule)				Lab practicals (see separate schedule)			
41	Mon	05-Oct	Lab practicals (see separate schedule)				Lab practicals (see separate schedule)			
	Tues	06-Oct	Lab practicals (see separate schedule)				Lab practicals (see separate schedule)			
	Weds	07-Oct	Lab practicals (see separate schedule)				Lab practicals (see separate schedule)			
	Thurs	08-Oct	Lab practicals (see separate schedule)				Lab practicals (see separate schedule)			
	Fri	09-Oct	Lab practicals (see separate schedule)				Lab practicals (see separate schedule)			
42	Mon	12-Oct	Lab practicals (see separate schedule)				Lab practicals (see separate schedule)			
	Tues	13-Oct	Lab practicals (see separate schedule)				Lab practicals (see separate schedule)			
	Weds	14-Oct	Lab practicals (see separate schedule)				Lab practicals (see separate schedule)			
	Thurs	15-Oct	Lab practicals (see separate schedule)				Lab practicals (see separate schedule)			
	Fri	16-Oct	Lab practicals (see separate schedule)				Lab practicals (see separate schedule)			
43	Mon	19-Oct	Finalise lab reports and study for exam				Finalise lab reports and study for exam			
	Tues	20-Oct	Finalise lab reports and study for exam				Finalise lab reports and study for exam			
	Weds	21-Oct	Finalise lab reports and study for exam				Finalise lab reports and study for exam			
	Thurs	22-Oct	Finalise lab reports and study for exam				Finalise lab reports and study for exam			
	Fri	23-Oct	Oral presentation of lab practicals				Oral presentation of lab practicals			
44	Mon	26-Oct	Pre-exam Q&A session?				Finalise lab reports and study for exam			
	Tues	27-Oct	Finalise lab reports and study for exam				Finalise lab reports and study for exam			
	Weds	28-Oct	Finalise lab reports and study for exam				Finalise lab reports and study for exam			
	Thurs	29-Oct	Finalise lab reports and study for exam				Finalise lab reports and study for exam			
	Fri	30-Oct	Exam							

Lectures

Lectures will be given from 9-12, online via Zoom. The lectures are designed to provide students with an introduction to the area. It is expected that the students will supplement the lectures with reading (suggested by the lecturer).

Lab practicals

There are three practicals in the course. These practicals are linked to the lectures and are designed to give you 'hands on' experience in protein chemistry. The practicals are compulsory. A separate schedule for practicals will be handed out at a later stage (once class numbers are known).

1. Practical 1: Computer analysis of protein structure
2. Practical 2: Insertion of proteins into membranes
3. Practical 3: Assembly of proteins into complexes

Written laboratory reports should be submitted through Athena no later than 2 weeks after the lab has been completed. The lab instructors will provide feedback and corrections on these reports. The reports should be approved no later than 3 weeks after the course has finished.

Literature assignments

The literature assignments are designed to develop (1) the students' self-learning skills, (2) their ability to work in groups, and (3) their ability to present scientific concepts. All of these skills are important in the workplace.

Students will be divided into small groups and given an exciting and contemporary area of protein biogenesis to investigate. The group will then be expected to delve into the primary scientific literature and write a single report, which will be circulated to the class. They will also be expected to present a seminar to the class and answer questions. The scope of the projects is usually quite broad, but nevertheless the groups are encouraged to focus on molecular details and mechanisms.

Assessment

Students will be assessed on three activities.

1. Literature assignments-
Students will be given a mark for their written report (5% of the course) as well as a mark for the oral presentation (5% of the course). There will also be questions in the exam related to these projects (10% of the course)
2. Laboratory practical's-
Attendance at all labs is a requirement to pass the course and the reports must be completed within the designated time frame.
3. Theory-
There will be a final exam consisting of short questions that are designed to assess the students' knowledge of material covered in the lectures (80% of the course).