

**Biophysics curriculum - Molecular Biology MSc**  
Autumn semester, 2024/25

Week	Date	Number	Title	Lecturer	Location
1	9-Sept	1	Introduction. Electromagnetic waves , the properties of light (interference, photoelectric effect, photon theory). Matter waves. Thermal radiation.	NP	LSB F.015-016
		2	Generation and absorption of X-ray, X-ray crystallography.	JA	LSB F.015-016
2	16-Sep	3	Molecular spectra, Jablonski diagram, fluorescence, fluorescence applications.	JA	LSB F.015-016
		4	Sedimentation and electrophoresis. Mass spectrometry.	SZGT	LSB F.015-016
3	23-Sep	5	Basic principles of lasers, special fluorescence methods (FRET, anisotropy, quenching, bleaching).	FZs	LC 0.07
		6	Optics, optical microscopy, introduction to electron microscopy.	VGy	LSB F.015-016
4	30-Sep	7	Advanced concepts of electron microscopy.	NP	LC 0.07
		8	Nuclear physics. Nuclear binding energy, radioactivity, law of radioactive decay, radioactive series.	HP	LSB F.015-016
5	7-Oct	9	Features of nuclear radiation and its interaction with absorbing material. Detection of radiation.	SzJ	LSB F.015-016
		10	Radiation biophysics: target theory, direct and indirect action of radiation. Dosimetry. Biological effects of radiation.	KT	LSB F.015-016
6	14-Oct	11	Experimental, diagnostic and therapeutic application of isotopes. Accelerators.	DBA	LSB F.015-016
		12	Basic principles of nuclear magnetic resonance, NMR spectroscopy in biology and medicine.	DBA	LSB F.015-016
7	<u>1st SCT</u> <u>Lectures 1-10,</u> <u>week7, 21 October</u>				
	21-Oct	13	Advanced concepts of NMR spectroscopy.	DBA	LC 0.07
		14	Advanced concepts of X-ray crystallography.	NE	LC 0.07
8	28-Oct	15	Chemical potential. Brownian motion. Diffusion at the molecular level, statistical interpretation. Fick's laws. Osmosis.	VáGy	LSB F.015-016
		16	The structure of biological membranes. Membrane transport.	VáGy	LSB F.015-016
9	4-Nov	17	Thermodynamic equilibrium potentials (Nernst, Donnan). Diffusion potential, Goldman-Hodgkin-Katz equation.	VZ	LSB F.015-016
		18	Ion channels (gating, selectivity), the "patch clamp" technique.	VZ	LSB F.015-016
10	11-Nov	19	Resting potential, action potential, and electrical excitability. Measurement of membrane potential.	PGy	LSB F.015-016
		20	Advanced concepts of electrophysiology.	SzGT	LC 0.07
11	<u>2nd SCT</u> <u>Lectures 1-18, approx. 90% of the questions will focus on topics not included in the 1st SCT.</u> <u>Week11, 18 November</u>				
	18-Nov	21	CD and Raman spectroscopy.	DBA	LC 0.07
		22	Advanced microscopy techniques I.: 3D imaging and dynamical studies of cells (confocal microscopy, FRAP, FCS).	NE	LC 0.07
12	25-Nov	23	Flow cytometry and cell sorting I.	RI	LC 0.07
		24	Flow cytometry and cell sorting II.	RI	LC 0.07
13	2-Dec	25	Advanced microscopy techniques II.: high-resolution microscopies (AFM, STED, STORM, TIRF).	VáGy	LC 0.07
		26	Basic principles of structural biology and molecular dynamics simulations.	NP	LC 0.07
14	9-Dec	27	Problem-oriented, integrative lecture.	NP	LC 0.07
		28	Research in the Institute.	PGy	LSB F.015-016

**Biophysics Lecture:**

Monday, 12:00-12:45 and 13:00-13:45

Locations: LSB F.015-016 or LC 0.07 (see the table)