

Syllabus – Practical Exercises of Biophysics 2021

Laboratory 1

(students work in smaller groups according to the schedule, detailed instructions for individual tasks are in the IS)

Task I. Basics optical laboratory methods

Spectrophotometry – Absorption curve and determination of concentration of eosin
Refractometry – Determination of NaCl concentration
Optotypes – visual acuity

Task II. Properties of liquids

The surface tension of liquids.
Viscosity measurement.

Task III. Ultrasound and ionising radiation

Hemolysis of erythrocytes by ultrasound
Measuring ionising radiation absorption

Laboratory 2

(students work in smaller groups according to the schedule, detailed instructions for individual tasks are in the IS)

Task IV. Electrical parameters

Measuring the voltage and frequency of electric signals with the oscilloscope
Frequency dependence of tissue and tissue model impedance.
Skin resistance measurement

Task V. Monitoring 1

Measurement of skin temperature – Thermocouple,
Blood pressure measurement by the auscultation method

Task VI. Monitoring 2

Conductometry – electrical parameters of membranes
Audiometry – hearing, sound intensity and loudness
Blood flow measurement by the Doppler ultrasonic flowmeter

Collective Exercises

This tasks we will do together, so it is very important to prepare theoretically and use for preparation all accessible sources. Main and most important source for you is the **Fundamentals of Biophysics and Medical Technology** (Hrazdira et al, 2012), but many information you can find at the other places (libraries, internet...).

Task I. Electromagnetic radiation and its perception.

Required knowledge:

Properties of electromagnetic radiation including basic formulas. Spectrum of the EMR.
Measurement of the illuminance.
Thermoregulation of a human body.
Contact and contactless thermography. Thermocamera and thermovision.

Task II. Electric currents. ECG measurement. Physiotherapy.

Required knowledge:

Properties of electric currents. Effect of the direct and alternating currents to the biological objects.
Electrotherapeutic methods. Electrical excitability. Electrodiagnostic methods (active, passive).
Physics in physiotherapy (magnetic field, laser and others).

Task III. Imaging methods. Ultrasound imaging of the gallbladder. X-ray images.

Required knowledge:

Properties and production of ultrasound. Medical applications of ultrasound - diagnostic and therapeutic usage. Doppler effect and medical applications - velocity of the blood flow.
Properties of X-rays and medical applications including CT.
Principle of NMR and MRI.
Types of the endoscopes