

## Entrance Exam for MSc Biochemistry

All applicants that meet the requirements for MSc Biochemistry must take the entrance exam. To pass the exam applicants must answer correctly **at least half of the questions**.

### The Exam structure:

- **60 multiple choice questions** with one or more correct answers.
- Up to **90 minutes** to complete the test.
- The test is held **online** (all the instructions will be provided to the applicants personally).
- All applicants take the test at the same time once a year (it is normally taking place in June). The exact date for each year admission is announced in May.

The **syllabus** for the exam is based on all topics found in a book by **Lehninger “Principles of Biochemistry”**. An overview of the topics is displayed bellow.

Introduction. Historic premises. Molecular composition and raise of cells. Genetic code up to <i>Homo sapiens</i> .
Nucleic acids. Structure and functions. Mutability factors. Gene engineering enzymes, PCR. DNA sequencing and genomics. Foundation of RNA functions. Transcriptomics.
Proteins. Protein structure, folding and stability. Turnover of proteins in a cell. Proteomics: premises, methods, outcome.
Protein functions. Hemoglobin case study. Enzymes as biocatalysts: general concepts, thermodynamics and kinetics. Michaelis-Menten model of enzyme kinetics. The active site of enzyme, specificity, coenzymes. Types of enzyme catalysis. Enzyme inhibition and regulation of activity in a cell.
Carbohydrates. Structure and biological functions. Glycoproteins, proteoglycans, peptidoglycans – structure and biological functions.
Lipids. Structure and functions. Lipid polymorphism, phase transition temperature. The composition of biological membranes. Membrane structures.
Solute transport across membrane. Channels, mechanism of action. Active transport, ATPases and ABC transporters.
General metabolism scheme. Glycolysis. Regulation of carbohydrate metabolic pathways.
Fatty acid catabolism. Oxidation of fatty acids. Ketone bodies.
Protein catabolism. Pathways of amino acid degradation. Production of urea.
The citric acid cycle. Glyoxylate cycle.
Oxidative phosphorylation.
Photosynthesis. Calvin cycle.
Biosynthesis of carbohydrates.
Biosynthesis of lipids.
Biosynthesis of amino acids and biologically relevant peptides.
Metabolism of nucleic acids.