

<b>Module Name</b> Medical Biochemistry – Enzymes, Metabolites and Diseases (Schwarz)					
<b>Identification Number</b>	<b>Workload</b>	<b>Credit Points</b>	<b>Term</b>	<b>Offered Every</b>	<b>Duration</b>
MN-BC-BSM01	360 h	12 CP	1 <sup>st</sup> or 2 <sup>nd</sup> term	Winter, 1 <sup>st</sup> half	7 weeks
<b>1</b>	<b>Type of lessons</b> a) Lectures b) Practical/Lab c) Seminar	<b>Contact Times</b> 24 h 154 h 8 h	<b>Self-Study Times</b> 48 h 102 h 24 h	<b>Group Size*</b> max. 20 max. 2 max. 5	
<b>2</b>	<b>Module Objectives and Skills to be Acquired</b> Students who successfully completed this module ... <ul style="list-style-type: none"> <li>• have acquired detailed knowledge on biosynthesis of cofactors and coenzymes, their relation to basic metabolism of nucleotides and amino acids and are enabled to recognize common themes in enzymatic catalysis and metabolic networks. In particular, disorders and treatments of inborn errors in metabolism are understood and can be connected to basic biochemical problems.</li> <li>• can independently develop strategies for protein purification and characterization and are able to analyze enzymes on different levels, such as primary sequence, domain structure, oligomerization and three-dimensional structure.</li> <li>• can determine enzyme activities, describe their reaction mechanism and uncover the action of different types of inhibitors.</li> <li>• can independently carry out small scientific projects related to the topic of the module.</li> <li>• have learned how to present research results in oral and written form and to critically discuss scientific publications related to the topic of the module on a professional level.</li> <li>• are able to transfer skills acquired in this module to other fields of biochemistry</li> </ul>				
<b>3</b>	<b>Module Content</b> <ul style="list-style-type: none"> <li>• Protein purification using column chromatography</li> <li>• Biophysical, biochemical and structural analysis of proteins (spectroscopy, mass spectrometry, size exclusion, electrophoresis, determination of domain structure)</li> <li>• Recombinant protein expression (His-tagged, intein-tagged, untagged)</li> <li>• Enzyme kinetics incl. inhibition, regulation, electron transfer (spectroscopy, HPLC, stopped-flow)</li> <li>• Assembly of protein complexes and determination of protein-interaction (isothermal titration calorimetry, differential scanning calorimetry, surface plasmon resonance, co-sedimentation)</li> <li>• HPLC analysis of metabolites in urine and blood</li> <li>• Maturation of enzymes, cellular localization, enrichment of organelles</li> <li>• Screening for inhibitors</li> <li>• Viability of cells (neurons, fibroblast)</li> <li>• Biogenesis of cofactors and coenzymes</li> <li>• Nucleotide and amino acid metabolism</li> <li>• Inborn errors in metabolism</li> <li>• Drug development</li> </ul>				
<b>4</b>	<b>Teaching Methods</b> Lectures; Practical/Lab (Project work); Seminar; Guidance to independent research; Training on presentation techniques in oral and written form				
<b>5</b>	<b>Prerequisites</b> Enrolment in the Master's degree course "Biochemistry and Molecular Medicine", in the Master's degree course "Biological Sciences" or in the Master's degree course "Chemistry"				
<b>6</b>	<b>Type of Examination</b> The final examination consists of three parts: Two hours written examination about topics of the lectures and the practical/lab part (50% of the total module mark), oral presentation (25% of the total module mark) and seminar paper (25% of the total module mark)				

7	<p><b>Credits Awarded</b> Regular and active participation; Each examination part at least “sufficient” (see appendix of the examination regulations for details)</p>
8	<p><b>Compatibility with other Curricula</b> Subject module in the Master’s degree course “Biological Sciences”; combined advanced and experimental module in the Master's degree course “Chemistry”</p>
9	<p><b>Proportion of Final Grade</b> 10%</p>
10	<p><b>Module Coordinator</b> Prof. Dr. Günter Schwarz, phone 470-6440, e-mail: <a href="mailto:gschwarz@uni-koeln.de">gschwarz@uni-koeln.de</a></p>
11	<p><b>Further Information</b> Biochemical Subject Module of the Master's degree course “Biochemistry and Molecular Medicine” Literature:</p> <ul style="list-style-type: none"> <li>• Berg, J.M., Tymoczko, J.L., Stryer, L. (2012) Biochemistry. 7<sup>th</sup> edition, Springer Spektrum</li> <li>• Voet, D., Voet, J.G. (2011) Biochemistry. 4<sup>th</sup> edition, Wiley &amp; Sons</li> <li>• Frey, P.A., Hegemann, A.D. (2007) Enzymatic Reaction Mechanisms. Oxford University Press</li> <li>• Additional subject-specific literature will be provided at the beginning of the module</li> </ul> <p>Note: The module contains hand-on laboratory work conducted by small groups of students and is taught in course rooms and research laboratories. The module does not contain computer-based research as a main component. General time schedule: Weeks 1-5 (Mon.-Fri.): Lectures, practical/lab, preparation for the seminar talk (topic and date will be arranged individually); Week 6 (Mon.-Fri.): Writing seminar paper; Week 7 (Mon.-Fri.): Preparation for the written examination</p>

\* 8 students from the Master's degree course “Biochemistry and Molecular Medicine”, 2 students from the Master's degree course “Biological Sciences” and 2 students from the Master's degree course “Chemistry”.