<table>
<thead>
<tr>
<th>Na Name of subject:</th>
<th>BIOCHEMISTRY I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faculty:</td>
<td>Medicine</td>
</tr>
<tr>
<td>Major:</td>
<td>medicine</td>
</tr>
<tr>
<td>Speciality:</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Level of studies</td>
<td>Uniform MA Studies X</td>
</tr>
<tr>
<td>Form of studies</td>
<td>full-time X part-time X</td>
</tr>
<tr>
<td>Year of studies</td>
<td>I</td>
</tr>
<tr>
<td>Type of class:</td>
<td>obligatory X elective [ ]</td>
</tr>
<tr>
<td>Language of instruction:</td>
<td>English X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter semester</td>
</tr>
<tr>
<td>Summer semester</td>
</tr>
<tr>
<td>17</td>
</tr>
</tbody>
</table>

| Total per year: | 67 |

Educational aims: (max. 6 items)

C1. Acquisition of the knowledge on the metabolism of the main groups of chemical compounds in physiological and pathological conditions.

C2. Understanding the processes leading to the diversion of normal into pathological biochemical pathways, and molecular basis of chosen disorders development.

C3. Acquaintance with the basic scientific techniques applied in biochemistry.

C4. Familiarity with the analysis and interpretation of the results obtained in biochemical experiments (calculations, graphs analysis etc.).

C5. The formation of an essential biochemical foundation for further insight into molecular processes in pathological conditions and the possibilities of their regulation, in the subsequent stages of medical education.
The education result matrix for the course in relation to the methods of intended education result verification and to the type of class.

<table>
<thead>
<tr>
<th>No. of the subject education result</th>
<th>No. of the education result</th>
<th>Student who has obtained a credit from the subject knows/can/is able to</th>
<th>Methods of the achievement verification</th>
<th>Type of class</th>
</tr>
</thead>
<tbody>
<tr>
<td>W1 B.W1.</td>
<td></td>
<td>Student: Describes biochemical regulation of water-electrolyte metabolism in biological systems;</td>
<td>test, presentation, oral response, report, colloquium, written examination</td>
<td>L, SE, LC</td>
</tr>
<tr>
<td>W2 B.W2.</td>
<td></td>
<td>Understands acid-base balance and the mechanism of buffering in physiological fluids, and their significance in the organism homeostasis;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>W3 B.W10.</td>
<td></td>
<td>Knows the structure of simple organic compounds – components of macromolecules present in cells, extracellular matrix and body fluids</td>
<td></td>
<td></td>
</tr>
<tr>
<td>W4 B.W11.</td>
<td></td>
<td>Describes the structure of polysaccharides, and understands their functions within intracellular and extracellular structures;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>W5 B.W12.</td>
<td></td>
<td>Knows primary, secondary, tertiary and quaternary structures of proteins; knows posttranslational and functional protein modifications and their significance;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>W6 B.W15.</td>
<td></td>
<td>Describes the basic catabolic and anabolic pathways, the modes of their regulation, and the impact of genetic and environmental factors;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>W7 B.W16.</td>
<td></td>
<td>Understands and compares metabolic profiles of the basic organs and systems;</td>
<td></td>
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</tr>
<tr>
<td>W8 B.W17.</td>
<td></td>
<td>Knows the concepts of oxidative potential of the organism and oxidative stress;</td>
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<tr>
<td>W9 B.W19.</td>
<td></td>
<td>Explains medical consequences of an improper diet including the intake of excess-carbohydrates meals;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U1 B.U3.</td>
<td></td>
<td>Student: Indicates the relation between factors disturbing the equilibrium of biological processes, and physiological/pathophysiological changes.</td>
<td>test, presentation, oral response, report, colloquium, written examination</td>
<td>L, SE, LC</td>
</tr>
<tr>
<td>U2 B.U4.</td>
<td></td>
<td>Performs biochemical calculations (calculates molar and per cent concentrations of compounds in solutions).</td>
<td></td>
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</tr>
<tr>
<td>U3 B.U7.</td>
<td></td>
<td>Can foresee the direction of biochemical processes on the basis of the energetic status of the cell;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U4 B.U8.</td>
<td></td>
<td>Describes biochemical changes in the organism functioning in the situation of homeostasis disturbance, especially defines its biochemical response to physical exercise, exposition to high or low temperature, the loss of blood or water;</td>
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<td></td>
</tr>
<tr>
<td>U5 B.U10.</td>
<td></td>
<td>Uses basic laboratory techniques such as quality analysis, titration, spectrophotometry, pH measurements, chromatography, electrophoresis of proteins and nucleic acids, applied in biochemistry;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
** U6. B.U11. **
Handles simple measurement utilities applied in biochemistry, and evaluates the precision of the performed measurements;

** U7. B.U12. **
Takes advantage of biochemical data bases including the Internet ones, and is able to search for the required information with the aid of the available tools;

** U8. B.U15. **
Can design and perform a simple biochemical scientific investigation, interpret the obtained results, and draw conclusions.

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Please use a cross to mark a scale 1-3, how the mentioned education results place Your class in the following sections: the transfer of knowledge, transfer of skills: (ex. knowledge +++; skills ++)

** Knowledge (K): +++ **

** Skills (S): +++ **

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** Student’s workload input (ECTS points) **

<table>
<thead>
<tr>
<th>The form of student’s workload</th>
<th>Student’s workload (h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Lessons on-site (hrs.):</td>
<td>67</td>
</tr>
<tr>
<td>2. Student’s own work (hrs.):</td>
<td>23</td>
</tr>
<tr>
<td>Summary of the student’s workload:</td>
<td>90</td>
</tr>
<tr>
<td>ECTS points per subject:</td>
<td>3.5</td>
</tr>
</tbody>
</table>

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** Notes:**

** Subject of class:** (please provide the topic of individual classes including type of class; remember the topic of class has to translate into intended education results).

In the case of coordinated subjects, please provide the topic of performed classes separately for each unit performing them:

** Lectures **

1. (1h) The structure of peptides and proteins. Peptide hormones.
2. (1h) Structure and functions of fibrous and globular proteins.
3. (2h) Enzymes – properties and kinetics.
4. (1h) Mechanisms of action and regulation of enzyme activity.
5. (2h) Transport across membranes, membrane receptors.
6. (1h) Catabolic processes. Tricarboxylic acid cycle.
7. (1h) Respiratory chain and oxidative phosphorylation.
8. (1h) Oxidative stress and antioxidant potential of the organism.
9. (1h) Structure and function of carbohydrates.
10. (1h) Glucose metabolism.
11. (1h) Glycogen metabolism.
12. (1h) Fructose and galactose metabolism.
13. (1h) Metabolism of heteroglycans.
14. (2h) Regulation of carbohydrate metabolism.

** Seminars **

3. Regulation of metabolism by control of enzyme activity.
4. The functions of biological membranes
5. Transport across biological membranes
6. Oxidoreductases and their cofactors
8. Tricarboxylic acid cycle – connections with other metabolic pathways.
10. The control of blood glucose concentration, and its disturbances leading to diabetes.
Classes
Laboratories

I laboratory section  AMINO ACIDS, PROTEINS AND ENZYMES

1. Introductory classes; acquaintance with safety regulations, measurement utilities in the biochemical laboratory, and biochemical calculations. Determination of inorganic phosphate.
2. Isolation and quantitative determination of fibrinogen.
3. Studies on kinetics of phosphatase reaction.
4. Determination of isoelectric point of proteins. Credit for I laboratory section

II laboratory section  OXIDATIVE PROCESSES

5. Quantitative determination of vitamin C.
6. Examination of enzymatic reactions catalyzed by succinate dehydrogenase.
7. Examination of the reaction catalyzed by horseradish peroxidase.
8. Determination of catalase activity. Credit for II laboratory section.

III laboratory section  CARBOHYDRATE METABOLISM

10. Effect of pH on saccharase activity.
11. Glycogen degradation by muscle pulp's enzymes.
12. Determination of salivary amylase activity. Credit for III laboratory section.
13. Repetition of laboratories. Credit for the summer semester.
14. III terms of laboratory tests.

Primary sources: (list in accordance with significance, not more than 3 items)
1. Richard A. Harvey et al. “Lippincot’s Illustrated Reviews: Biochemistry”

Secondary sources with other didactic help: (not more than 3 items)
1. Thomas M. Devlin „Biochemistry with Clinical Correlations”, Willey-Liss, New York

Requirements for teaching resources: (e.g. laboratory, multimedia projector, other ...)
1. Laboratories, seminar rooms, lecture halls.
2. Laboratory utilities; water baths, centrifuges, incubators, spectrophotometers, glassware, pippets, chemical reagents
3. Multimedia projectors, computers, whiteboards.

Preliminary terms and conditions:
(minimal terms and conditions required before the student commences the course).

Student should know the principles of chemistry and biology and have molecular biology, medical chemistry and biophysics courses completed (at the university level).

Conditions for completing the course: specify the terms and conditions for completing the classes included in the subject’s scope, specify the requirements the student has to meet to be allowed to sit in the theoretical and/or practical exam, specify the form of the exam and the requirements for passing the exam, specify the criteria for particular grades

In order to obtain a credit for biochemistry it is compulsory to get a credit for all thematic sections:
1. Properly conduct the experiments designed in the course plan and present reports summarizing the obtained data, calculations and conclusions (taking into account §12 subparagraph 3 of Wrocław Medical University Regulations of Studies “Student has a right to miss 10% of obligatory classes in a given subject without giving any explanation of the absence and without the necessity to repeat these classes”).
2. Actively participate in seminars – prepare and present chosen issues and actively participate in discussion.
3. Obtain a positive grade for all three laboratory exams covering both theoretical and practical material concerning three sections.

A credit for all the laboratory sections is a prerequisite for participation in the second semester in biochemistry.
Grade: | Grade criteria: (only for subjects completed with the exam)
---|---
Very good (5,0) |  
Good plus (4,5) |  
Good (4,0) |  
Sufficiently good (3,5) |  
Sufficient (3,0) |  

Name and address of unit conducting the course, contact information: telephone and e-mail
Department of Medical Biochemistry, Chałubińskiego 10, 50-368 Wrocław
Secretarial office: e-mail: biochsek@bioch.umed.wroc.pl; phone: 784-13-70

The list of teachers performing the classes: Name and Surname, academic or professional degree/title, field of study, occupation, type of classes:
In the case of coordinated subjects, please provide the topic of performed classes separately for each unit performing them.

<table>
<thead>
<tr>
<th>Teachers</th>
<th>Degree, field of science, profession</th>
<th>Form of classes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iwona Bednarz-Misa</td>
<td>Doctor of Medical Sciences, Biochemist, Laboratory diagnostician, adjunct</td>
<td>Laboratories, seminars</td>
</tr>
<tr>
<td>Izabela Berdowska</td>
<td>Doctor of Medical Sciences, Biochemist, adjunct</td>
<td>Lectures, laboratories, seminars</td>
</tr>
<tr>
<td>Małgorzata Krzystek-Kopacka</td>
<td>Doctor of Medical Sciences, Biochemist, adjunct</td>
<td>Laboratories, seminars</td>
</tr>
<tr>
<td>Małgorzata Matusiewicz</td>
<td>Doctor of Medical Sciences, Biochemist, adjunct</td>
<td>Lectures, laboratories, seminars</td>
</tr>
<tr>
<td>Ewa Seweryn</td>
<td>Doctor of Medical Sciences, Biochemist, adjunct</td>
<td>Laboratories, seminars</td>
</tr>
<tr>
<td>Bogdan Zieliński</td>
<td>Doctor of Medical Sciences, Biochemist, adjunct</td>
<td>Lectures, laboratories, seminars</td>
</tr>
</tbody>
</table>

Person responsible for the course:
Dr Małgorzata Matusiewicz

Drawn up on (date): 30.06.2015

The syllabus has been drawn up by
Dr Izabela Berdowska

Signature of the Head of the unit conducting the course:

The signature of the Dean of the Faculty of Medicine