## Appendix 5 to Resolution No. 15630 of Senate of Wroclaw Medical University of 30 March 2016

### Syllabus

**Description of the course**

<table>
<thead>
<tr>
<th>Module/Course</th>
<th>Basic of medical chemistry</th>
<th>Group of detailed education results</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Group code</td>
</tr>
<tr>
<td></td>
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<td>B</td>
</tr>
</tbody>
</table>

**Faculty**
Faculty of Dentistry

**Major**
Dentistry

**Specialties**

**Level of studies**
- Uniform magister studies X*
- 1st degree studies □
- 2nd degree studies □
- 3rd degree studies □
- postgraduate studies □

**Form of studies**
- X full-time
- □ part-time

**Year of studies**
- 1st

**Type of course**
- X obligatory
- □ limited choice
- □ free choice / elective

**Course**
- □ major X basic

**Language of instruction**
- □ Polish
- X English
- □ other

* mark □ with an X

### Number of hours

**Form of education**

<table>
<thead>
<tr>
<th>Unit teaching the course</th>
<th>Lectures (L)</th>
<th>Seminars (SE)</th>
<th>Audition, classes (AC)</th>
<th>Major Classes – not clinical (MC)</th>
<th>Clinical Classes (CQ)</th>
<th>Laboratory Classes (LC)</th>
<th>Practical Classes with Patient (PCP)</th>
<th>Specialist Classes – magister studies (SCM)</th>
<th>Foreign language Course (FLC)</th>
<th>Physical Education obligatory (PE)</th>
<th>Vocational Practice (VP)</th>
<th>Self-Study (Student's own work)</th>
<th>E-learning (E-L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter Semester</td>
<td>10</td>
<td>10</td>
<td>15</td>
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</tbody>
</table>

**Summer Semester**

|                          |              |               |                        |                                    |                      |                        |                                      |                                |                        |                               |                |                             |                |
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TOTAL per year:

<p>| | | | | | |</p>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>10</td>
<td>10</td>
<td>15</td>
<td></td>
<td></td>
<td>38</td>
</tr>
</tbody>
</table>

**Educational objectives** (max. 6 items)

C1. The transfer of knowledge in the field of structure, properties, and functions of the basic chemical components of tissues and biological fluids of humans.

C2. Get to know the basics of chemical homeostasis mechanisms and chemical composition of biological fluids, as a background for further biochemistry and physiopathology teaching.

C3. Teaching chemical calculations and interpretation of the results obtained from experiments performed.

C4. Development of appropriate ethical and proper communication skills.

**Education result matrix for module/course in relation to verification methods of the intended education result and the type of class**

<table>
<thead>
<tr>
<th>Number of course education result</th>
<th>Number of major education result</th>
<th>Student who completes the module/course knows/is able to</th>
<th>Methods of verification of intended education results (forming and summarising)</th>
<th>Form of didactic class <strong>enter the abbreviation</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>W 01</td>
<td>B.W1.</td>
<td>Knows the role of major and trace elements in the process occurring in the body, including the supply, absorption, transport and toxicity</td>
<td>Presentation, oral response</td>
<td>SE, MC</td>
</tr>
<tr>
<td>W 02</td>
<td>B.W1.</td>
<td>Describes water and electrolyte equilibrium</td>
<td>Presentation, oral response</td>
<td>SE</td>
</tr>
<tr>
<td>W 03</td>
<td>B.W2.</td>
<td>Knows and understands the definition of: pH, solubility, isionic, isohydric, isotonic equilibrium</td>
<td>Presentation, oral response</td>
<td>SE, MC</td>
</tr>
<tr>
<td>W 04</td>
<td>B.W2.</td>
<td>To characterize systemic buffers and understand their importance to homeostasis</td>
<td>Presentation, oral response</td>
<td>SE, MC</td>
</tr>
<tr>
<td>W 05</td>
<td>B.W2.</td>
<td>Is able to define the factors influencing the acid-base balance and characterize oxygen and carbon dioxide transport in the body</td>
<td>Presentation, oral response</td>
<td>SE, MC</td>
</tr>
<tr>
<td>W 06</td>
<td>B.W4.</td>
<td>Is able to describe the inorganic and organic components of selected biological fluids including saliva</td>
<td>Presentation, oral response</td>
<td>L, SE, MC</td>
</tr>
</tbody>
</table>

Determine the pH of body fluids including saliva
Describe the structure and properties of inorganic and organic components in body fluids and present in/on the cells of the human body

W 07                              | B.W11.                          | Describe the structure and properties of saccharides, polysaccharides, and lipids in/on the cells and extracellular matrix | Presentation, oral response                                                   | L, SE, MC                       |
<table>
<thead>
<tr>
<th>Code</th>
<th>Section</th>
<th>Description</th>
<th>Assessment Method</th>
<th>Pass</th>
<th>Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>W 08</td>
<td>B.W12.</td>
<td>Describe the structure and properties of amino acids and peptides, and their roles in cell and extracellular matrix</td>
<td>Presentation, oral response</td>
<td>L, SE, MC</td>
<td></td>
</tr>
<tr>
<td>W 09</td>
<td>B.W12.</td>
<td>Describes the I, II, III and IV levels of protein structures</td>
<td>Presentation, oral response</td>
<td>L, SE, MC</td>
<td></td>
</tr>
<tr>
<td>W 10</td>
<td>B.W10.</td>
<td>Describe the structure and properties of glycosaminoglycan, glycosides, lipids, steroids, proteins and mucins</td>
<td>Test 3: written test, open questions</td>
<td>L, SE, MC</td>
<td></td>
</tr>
<tr>
<td>W 11</td>
<td>B.W12.</td>
<td>Knows the importance of posttranslational modification of amino acids, amines characterized by the structure</td>
<td>Test 3: written test, open questions</td>
<td>SE, MC</td>
<td></td>
</tr>
<tr>
<td>W 12</td>
<td>B.W10.</td>
<td>Is able to recognize the types of chemical reactions occurring in biological systems</td>
<td>Presentation, oral response</td>
<td>L, SE, MC</td>
<td></td>
</tr>
<tr>
<td>U 01</td>
<td>B.U4.</td>
<td>Make a solution of a given concentration. Perform calculations of substance concentrations and solubility of the compounds using tables and formulas.</td>
<td>Reports to assess the knowledge of procedures prepared by students (student’s workbook)</td>
<td>L, SE, MC</td>
<td></td>
</tr>
<tr>
<td>U 02</td>
<td>B.U10.</td>
<td>Perform and describe a simple analytical chemical reaction</td>
<td>Evaluation and verifications of experimental results</td>
<td>SE, MC</td>
<td></td>
</tr>
<tr>
<td>U 04</td>
<td>B.U11.</td>
<td>Use laboratory equipment, measure the pH of the solution, and evaluate the accuracy of measurements</td>
<td>Assessment of teamwork</td>
<td>MC</td>
<td></td>
</tr>
<tr>
<td>U 07</td>
<td>B.U15.</td>
<td>Able to critically interpret the results</td>
<td>Assessment of laboratory skills: proper handling of measuring instruments, pH-meters. Verifications of experimental results and their proper analysis.</td>
<td>MC</td>
<td></td>
</tr>
<tr>
<td>U 08</td>
<td>B.U8.</td>
<td>Describe the structure of carbohydrates, proteins, simple and complex lipids, indicating the hydrophilic and hydrophobic parts, components, and type of bond</td>
<td>L, SE, MC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U 09</td>
<td>B.U4.</td>
<td>Perform calculations of substance concentrations and solubility of the compounds using formulas (percent and molar concentration), calculates the concentration of substances in isotonic solution</td>
<td>SE, MC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>K 01</td>
<td>K.01.</td>
<td>Accepts team work Participates in classes, and seminars Integrates with the group and accepts ethical standards</td>
<td>Assessment of personal and social competence through observation of</td>
<td>L, SE, MC</td>
<td></td>
</tr>
</tbody>
</table>
### Content of classes (please enter topic words of specific classes divided into their didactic form and remember how it is translated to intended educational effects)

#### Lectures

**Lectures 5x2 h=10**


#### Seminars

1. **Water solution as environment of life.** Electrolyte equilibrium in biological fluids. pH and chemical composition of biological fluids (saliva, gastric juice, urine, pancreatic juice, cerebrospinal fluid, blood serum). Micro- and macro minerals, toxicity elements. Simple and serial dilution.


3. **Amino acids and proteins.** Peptides with biological activity. Amino acids and proteins - biological fluids (human milk, saliva, plasma, gastric juice). The primary structure of proteins, types of bonds and interactions stabilizing the structure, the isoelectric point, the peptide bond. N- and C- terminal amino acid residues. Determination of the N- and C- terminal residue. The role of disulphide bonds in proteins. Non-protein amino acids, biogenic amines - formation and functions, peptides with biological activity. The damage to the structure of proteins by reactive oxygen species.


### Practical classes

#### Classes

All classes are based on Handbook of chemistry: for students Faculty of Medicine and Faculty of Dentistry; ed. Iwona Kątnik-Prastowska; Wrocław 2015

1. **Dilutions of solution**: simple and seral dilutions. Strip test, detection of glucose and pH of urine. Calculations and recalculation of concentrations.

2. **The preparation of buffer solutions**, the determination of buffer capacity by titration of the buffer solution using a strong base and strong acid. Calculation of pH of buffer and buffer capacities.

3. **Chemical reactions of amino acids**. Acylation of the α-amino group. Reactions of the α-amino group (Schiff’s base). Deamination of amino groups (Van Slyke’s reaction). Reaction of amino acids with ninhydrin, xanthoproteic reaction, identification of cysteine, the biuret assay. Reaction of a free amino group (Sanger reaction).

4. **Repetition and supplement program content from the previous Exercise (1-3)**

Partial test no 1. Calculations of concentrations of substances from chemical solutions and body fluids from classes 1, 2, 3.


8. **The electrophoresis of serum proteins an lipoproteins in agarose**. Densitometry analysis. Compare the results of physiological and pathological samples.

9. **The completion of laboratory classes**.

10. **Partial test no 3 (classes 7 and 8)**.

11. **The repetition of tests 1-3**.

Final test (includes lecture material).

### Other

1. Not applicable

### Basic literature (list according to importance, no more than 3 items)
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Chemistry. An Introduction to General, Organic and Biological Chemistry. Timberlake KC, Benjamin Cummings, Pearson Education, Inc., 2015
2. Handbook of chemistry: for students Faculty of Medicine and Faculty of Dentistry; ed. Iwona Kątnik-Prastowska; Wroclaw: Wroclaw Medical University, 2015

Additional literature and other materials (no more than 3 items)
1. Introduction to organic chemistry; WH. Brown; Harcourt Brace and Company, Inc., 2000 USA.
2. Organic Chemistry; G Solomons, C Fryhle; ed JOHN WILEY & SONS., Inc., 2000 USA

Didactic resources requirements (e.g. laboratory, multimedia projector, other...)
1. Chemical laboratory equipment
2. Overhead projector

Preliminary conditions (minimum requirements to be met by the student before starting the module/course)
Knowledge of high school chemistry

Conditions to receive credit for the course (specify the form and conditions of receiving credit for classes included in the module/course, admission terms to final theoretical or practical examination, its form and requirements to be met by the student to pass it and criteria for specific grades)
1. Mandatory presence on laboratory classes and seminars. Excused absence is counted in the additional period.
2. Obtaining positive evaluations (60 % out of all points) of control tests and final test (includes lectures). Tests are oral or written and the latter have diverse forms: multiple choice, accounts, complement the text, patterns of selected compounds of sugars, fats, amino acid.
3. The final test is considered to be included after obtaining 60% points from the total pool of points.
4. Each question has a final test measurement point.

<table>
<thead>
<tr>
<th>Grade:</th>
<th>Criteria (only for courses/modules ending with an examination)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Good (5.0)</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Good Plus (4.5)</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Good (4.0)</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Satisfactory Plus (3.5)</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Satisfactory (3.0)</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

Name and address of module/course teaching unit, contact: telephone and e-mail address

Department of Chemistry and Immunochemistry, Wroclaw Medical University, ul. Bujwida 44a;
tel.: 71 328 26 95, tel/faks: 71 328 16 49;
e-mail: maria.katnik-prastowska@umed.wroc.pl
Coordinator / Person responsible for module/course, contact: telephone and e-mail address

Prof. dr hab. Maria Iwona Kątnik-Prastowska
tel.: 71 328 26 95, tel/faks: 71 328 16 49;
e-mail:maria.katnik-prastowska@umed.wroc.pl

List of persons conducting specific classes: full name, degree/scientific or professional title, discipline, performed profession, form of classes.

Lectures:
Prof. dr hab. M. Iwona Kątnik-Prastowska
Dr hab. Ewa M. Kratz, adiunkt

Seminars and Major Classes:
1. Dr hab. Magdalena – Orczyk Pawłowicz
2. Mgr Jolanta Lis-Kuberka, asystent

Date of Syllabus development
23.06.2016

Syllabus developed by
Dr Anna Lemańska-Perek

Signature of Head of teaching unit

Signature of Faculty Dean