Form No M-3 (5)

**Description of Study Course** MEDICAL CHEMISTRY

**1. Course title:** MEDICAL CHEMISTRY

**2. Course code:** 3820(pavasars) CFUBK_006

**3. Year of studies and semester:** 1st year 1st semester rudens(166)

**4. Course author:** assistant professor Aris Kaksis , aris.kaksis@rsu.lv

**5. Number of credit points:** (KP) 3

**6. Number of ECTS** (aprēķina forma KP x 1,5)**:** 4,5

**7. Academic Unit:** Department of Human physiology and biochemistry, Dzirciema street 16, room A- 403, Riga LV-1007, phone: 67061550, 67061552; e-mail: cfbk@rsu.lv

**8. Status of the course in the study Program:** basic study subject, 2nd level professional higher education study program „Medicine".

**9. Prerequisites:** Nepieciešamās priekšzināšanas: language skills (spoken and written), mathematics (algebra and geometry), chemistry, physics and biology (within the secondary school programme).

**10. Course description and objectives of the course.**

**Objectives of the course:** is promote today's concept formation about living processes substantial basement in human organism **homeostasis**, including exchange processes and substantial building of human body, it's functions, as well as understanding about biochemical mechanisms and biomedical properties, that could reveal disease native reasons and scientifically correct would implement actual medical problem solutions.

**Course description:**

Chemical equilibrium as an expression of the first and the second law of thermodynamics. Chemical potential $\mu=G^{o}+R*T*\ln(A)$. Osmotic pressure. Oxygen $O_2$ and water $H_2O$ transport enzymes across membranes **aquaporins**. Blood osmmolarity 0.305 mol/liter. Reaction velocity. Catalysts and influence factors. Basement of Enzymology with Arrhenius equation and reaction rate constant. Oxidation-reduction reactions, equations of Red-Ox Half reactions. Chemical equilibrium: potential, reaction rate, constant. Intermolecular actions of proteins, carbohydrates – saccharides, and nucleic acids DNA, RNA. Hydrogen and coordinative bond, its static biochemistry, The role of biology in human physiology **homeostasis**. Induced interaction. The seven main elements **H**, **C**, **O**, **N**, **P**, $Ca^{2+}$, **S** for building of the human organism**.**

Oxidation-Reduction, Ox-Red processes in the human organism. $pH=-\log([H_3O^+])$.

Henderson Hasselbah equation $pH=pK_a+\log(n_{salt}/n_{acid})$. Blood buffer

$pH = 7.025 + \lg([HCO_3^-]/[CO_2]) = 7.36$ solutions. Buffer capacity acidosis, alkaloses. Biologic ion $H^+$, $Na^+$, $K^+$, $HCO_3^-$ and $Cl^-$ channels through the membrane potential forming enzymes, their potentials and electric neuron impulses.

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## 11. Learning outcomes and assessment criteria:

*** Knowledge**: Students in results of study subject mastering are able:

- to formulate and to explain Medical Chemistry and Static Biochemistry concepts;
- to describe quantitative and qualitative concepts of Medical Chemistry processes;
- to estimate concentration meaning in human body of oxygen, glucose, **C$O_2$**, blood pH and osmmomolar concentration;
- to explain ion channel made membrane potential principles;
- to appose influence on health with food used nutrition compounds against some times wrong used harmful compounds;

**Practical skills and competence** Student know how to analyses biologic compound exchange and states of human **homeostasis**. Will know how estimate compound exchange and conversion in equivalent amounts, to be based on mass conservation and energy conservation rules. To be able analyses atomic properties of chemical elements integration and conversion into molecular buildings and aggregates properties, that would be able estimate interaction with environment and integrated compound exchange for maintenance of living functions, what will reflect student registered study work results, practical work conclusions, tests and colloquia.

***Assessment criteria:*** during semester colloquia, writing test works and practical work report paper examination; on finish of semester writing EXAM for **Medical Chemistry** experimental research study results and notated in study data base products: http://aris.gusc.lv/

## 12. Students' independent work and tasks: http://aris.gusc.lv/

Individual and work in paired groups in practical protocol and notes preparation classwork plane of studies. Self studies of theoretical subjects, using books or other sorces including scientific publications - literature.

## 13. Readings:

**** Recommended:***

1. A. Kaksis. "General Medical Chemistry", Med.BioChem Data Base RSU department, 2015.g, Lectures materials and practical studies at address: http://aris.gusc.lv/ Syllabus address: http://aris.gusc.lv/2017-18MFArz1LekcLdVK1s0.pdf**;**
2. David L. Nelsone, Michael M. Cox. *Lehniger Principles of Biochemistry*. ©2005. W.H.Freeman and Company,New York ISBN: 0-7167-4339-6; EAN:9 780716 743392

**** Optional:***

1. F. Horn, G. Lindenmeier u.a. 3.,grundl.überarb.Aufl. © 2005 Biochemie des Menschen 640 S., 1160 Abb., kart. Das Lehrbuch für das Medizinstudium

**** Other sources:***

Publications in PubMed data base journals selected for course materials: *http://aris.gusc.lv/*;

**14. Language:** English