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### თბილისის ჰუმანიტარული სასწავლო უნივერსიტეტი

**TBILISI HUMANITARIAN TEACHING UNIVERSITY**

**Syllabus**

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| **Name of the course /module** | **Biochemistry 2** |
| **Code of the course** | **PhM0414DM** |
| **Status of the course**  **(elective/compulsory)** | **C**ompulsory course  for the one-cycle higher educational Programme-Dentistry |
| **ECTS** | **4 credits.Total:100hours**  Contact Hours–49hours (Class Meeting Time Period:15L/30Pr. + 4 hours)  (Midterm:2h and Final Examination 2h):  Individual Work-51 hours |
| **Authors (lecturer)** | Marine Shavlakadze - Ph.D in Chemical and Biologica Engineering, THTU associated professor  Tel: 598550358  e–mail - marishavlakadze@gmail.com  Consultation days: according to consultation schedule |
| **Aim of the course** | The aim of the course is to teach future physicians the fundamentals of the ongoing biochemic processes in the nervous system, in particular, the distribution of enzymes and ions in different sections of the system. Formation mechanisms of ionic gradients and membrane potential, transportation forms of ions. The metabolism of proteins, carbohydrates and lipids in the brain, To teach the students the biochemical motives of the processes in the respiratory system; ferments involved in biological rusting and tissue respiration, transporting systems; the mechanisms of their activity; the components of tissue respiration; the regulating mechanisms of energy exchange processes, to teach the chemical composition of blood, proteins of the blood plasm and buffer systems; to discuss the blood coagulation system, the effect mechanisms of the coagulation and anti-coagulation systems; the phases of blood coagulation; to teach the biochemical motives of blood diseases and the methods of identifying various substances in blood, which are applied in clinical diagnostics. |
| **Program prerequisits** | **Biochemistry 1** |
| **Assessment system and criteria** | **Assessment system of the Tbilisi Humanitarian Teaching University's**is divided into the following components:  The total marks of the mid term Out of the overall assessment (100 points ) is 60 points, which includes three kinds of grades:  **Student’s activity during a semester;**  **One-midterm exam;**  **Final exam**-**40 points.**  Theminimum competence requirement for mid termevaluation components is at least 11 points in total.  **The minimum competence requirement of the final evaluation is 50% of the total mark from final evaluation that means 20 points out of 40.**  Evaluation System includes:  I. Five Forms of Positive Assessment:  (A) Excellent – 91% and more from maximum evaluation  (B) Very good – 81-90% from maximum evaluation  (C) Good – 71-80% from maximum evaluation  (D) Satisfactory – 61-70% from maximum evaluation  (E) Sufficient – 51-60% from maximum evaluation  II. Two Forms of Negative Assessment:  (A)(FX) Fail (Not passed ) - 41-50 from maximum evaluation score, which means that the student will need to work more and to retake the test after additional independent work;  (B) (F) Fail – A student gets 40 points, or less from maximum evaluation, which means that the work done by him/her is not sufficient and s/he has to retake the course from the beginning.  1. One of the negative assessment: In case of not passing, the University fixes additional exam at least in 5 days, after the announcement of final examination results, which must be published in the examination table.  2. The grades, which student gets after additional test is a student's final grades, in which is not considered the negative points of the major examination.  If a student receives from 0 to 50 points after additional test, in the final exam sheet is formed (F) -0 for the student. |
| **Course description** | appendix 1 |
| **Assessment system/activities, methods**  **and criteria** | The sum of the course assessment (100 points) breaks down as follows:   * **Activities**-**30 points** * **Midterm –30 pounts** * **Final exam -40 points** * **Academic activity** includes students work and involvement activity during the class (preparation state, knowledge of material, participation in class discussions about different problems, cases, writing quizzes, etc.) The student is assessed 15 times 2,0 points is maximal point for each class:   **2,0 points**: The student is well trained, correctly explains the practical nature of the tasks set forth in the syllabus material fluently. Answers to the questions arecomplete, correct and justified. The student is aware of the problem and are well aware of the issue.  **1,0 point:** The student possesses scarcely a part of the syllabus provided by the community, answers to the questions are correct, but incomplete / unsubstantiated.  **0 points:** The student is not ready. Does not possess the prescribed syllabus topic, is not able to answer the questions.  **Midterm exam - 30 points,** administered in writtenform, The questions from covered material and maximal 30 points. Each correct answer is evaluated with 1 point, wrong answer -0 points.  **Final Exam -40 points**The examination is conducted by a combination of written(computer test) and verbal exam and includes:   * The computer test -**25 points** * Verbal task -**15 points** / 3 briefbrief topics, each is equal 5points   Criteria of assessment of verbal topics are :  **5 points –**The answer is complete; Terminology is configured; student obtains perfect knowledge of the topic, s/he coveres of the material fluently, summarises core and additional literature, reveales critical thinking and logical analysis.  **4 points** -The answer is not absolutely complete; student obtains knowledge of the topic, without important mistakes, s/he coveres of the material fluently, summarises core literature, reveales critical thinking and logical analysis.  **3 points -** The answer is not complete; student obtains satisfactory knowledge of the topic, s/he coveres of the material by mistakes, summarises core literature, reveales less of critical thinking and logical analysis.  **2 points** - The answer is weak; student obtains satisfactory knowledge of the topic, makes mistakes, doenot summarises core literature, cant make critical thinking and logical analysis.  **1 points -** The answer is substantially incorrect. Set out in the relevant material of the individual fragments. The student is not able to analyze the material.  Duration of final exam 2h. |
| **Core literature:** | Textbook of Biochemistry With Clinical Correlations,T.M. Devlin. |
| **Additional literature** | 1. Harpers Illustrated Biochemistry 29th Edition , 2011 2. Harper’s illustrated biochemistry By Robert K. Murray and at all. 2009 3. Biochemistry. Lippincott’s Illustrated Reviews - Pamela C. Champe, Richard A.Harvey., Denise R.Ferrier . 6th edition, 2014 |
| **Learning outcomes, competences**  **(general and field specific)** | **Knowledge**   1. Student describes ongoing biochemic processes in the nervous system, the regulating mechanisms and current biochemical processes in the respiratory system 2. Student identifies biochemical motives of blood diseases and the methods of identifying various substances in blood, which are applied in clinical diagnostics. 3. Student applies basic knowledge of safety standards and equipment of biochemical laboratories; and simple methods of laboratory working.   **Skills**   1. Student combines theoretical approaches to explain structural-functional relations in macromolecules for understanding disordersof the nervous, respiratory and cardiovascular systems 2. Student correlates biochemical changes in different type of diseases 3. Student integrates the vital processes occuring in the nervous system with relevant conclusions based on the analysis 4. Student evaluates the general health condition on the basis of the theoretical and practical knowledge of the circulatory system   **Responsibilities**   1. Student uses Strategic planning in the learning process 2. Student manages the time of individual work to realize the peculiarities of the learning process |
| **Learning/Teaching methods** | Lecture/ practical/ Laboratories  Individual/Group work  Verbal teaching method  Demonstration of study materials  Presentation  Explanation methods  Discussion/debate |

**appendix1**

**Course description:**

**Topics of the lecture, practical classes/laboratory work/working group, literature**

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| **Week №** | **Type of**  **the class** | **Topics** | **Contact hours** | **literature** |
| **Iweek** | Lect. | Cell Signaling by chemical Messengers: receptors, messengers. General principles and pathways of signal transduction. Signaling cascade pathways. | **1** | **1** |
| Pract. | Cell signaling by chemical messengers: receptors, cell surface and intracellular receptors, their ligands, ways of signaling. | **2** | **1** |
| **IIweek** | Lect. | intracellular signaling, second messengers, signaling cascade pathways | **1** | **1** |
| Pract. | General principles and pathways of signal transduction. cell surface receptors: Ion-gated, enzyme-linked, GPCR and cytokine receptors, their representatives. | **2** | **1** |
| **IIIweek** | Lect. | Lipids of the brain: Glycerophosphatides, Phosphonizitades, sphingolipids, ceramids, sphyngomielini, Glycosphingolipids, prostaglandins, cholesterin, myelin, the lipid composition of myelin. | **1** | **1** |
| Pract. | The biochemic conversion of aminoacidsin the brain. Biogenic amines. intracellular signaling, second messengers, signaling cascade pathways, clinical correlations | **2** | **1** |
| **IVweek** | Lect. | The biochemic conversion of aminoacids in the brain. Distribution of gamma –aminobutyric acid in the brain. The separate representatives of neurontransmitters.Biogenic amines | **1** | **1** |
| Pract. | Intracellular signaling, second messengers, signaling cascade pathways, clinical correlations. Lipids of the brain: Glycerophosphatides, Phosphonizitades, sphingolipids, ceramids, sphyngomielini, Glycosphingolipids, prostaglandins, cholesterin, myelin, the lipid composition of myelin. | **2** | **1** |
| **V week** | Lect. | The biochemic conversion of aminoacids in the brain. | **1** | **1** |
| Pract. | Distribution of gamma –aminobutyric acid in the brain. The separate representatives of neurontransmitters.Biogenic amines. | **2** | **1** |
| **VIweek** | Lect. | Respiration. External and cellular respiration.  Tissue respiration; mitochondria enzymes and transporting systems.The respiratory chain; oxidating phosphorylation; the mechanism of oxidatingposphorylation. Role in energy production. | **1** | **1** |
| Pract. | The enzymes involved in tissue respiration; flavin-dependent dehydrogenase; cytochromes; ubichinon (CoQ ); proteins (NHJ) containing hemin iron. | **2** | **1** |
| **VII week** | Lect. | Inhibitors and uncouplers of the cellular respiration. otheroxidoreductases  involved in biological oxidation; microsomal oxidation. | **1** | **1** |
| Pract. | The enzymes involved in tissue respiration; flavin-dependent dehydrogenase; cytochromes; ubichinon (CoQ ); proteins (NHJ) containing hemin iron. | **2** | **1** |
| **VIII week** | **Midterm** | | **2** |  |
| **IX week** | Lect. | Mechamism of external respiration. Role of RBCs in respiration and oxygenation of the tissues.Hemoglobin- structure, function, role in respiration. Allosteric factors, influencing on hemoglobin’s affinity to oxygen. Methhemoglobinemia, hemoglobinopathies: Sickle cell anemia, Thalasemias, etc. Regulation of respiration.  Other oxidoreductases  involved in biological oxidation;  microsomal oxidation. Clinical coorelations. | **1** | **1** |
| Pract. | Coupling of respiratory chain and oxidative posphorylation; substrate-level phosphorylation; Inhibitors and uncouplers of the cellular respiration. Respiration. External and cellular respiration. themechamism of external respiration. Role of RBCs in respiration and oxygenation of the tissues.Hemoglobin- structure, function, role in respiration. Allosteric factors, influencing on hemoglobin’s affinity to oxygen. Methhemoglobinemia, hemoglobinopathies: Sickle cell anemia, Thalasemias, etc. Regulation | **2** | **1** |
| **X week** | Lect. | Biochemistry of cardiovascular system. Energetic supply for cardiac muscle. Specific regulatory pathways charcteristic for cardia. Specific cardiovascular isoenzymes. Lipid metabolism: | **1** | **1** |
| Pract. | How cardiac muscle works. Energetic supply for cardiac muscle. Specific regulatory pathways charcteristic for cardia. Specific cardiovascular isoenzymes. | **2** | **1** |
| **XI week** | Lect. | Cholesterol metabolism. regulation of cholesterol metabolism. Hypercholesterolemias. | **1** | **1** |
| Pract. | lipoproteins: VLDL, LDL, IDL, HDL and chilomicrones . their characterization and role in metabolism . | **2** | **1** |
| **XII week** | Lect. | Enzymes, used in diagnosis of different cardiovascular pathologies. Isoenzymes role in differential diagnosis of the CV diseases. | **1** | **1** |
| Pract. | Lipid metabolism. beta-oxidation of fatty acids. triacylglycerolmetabolis. | **2** | **1** |
| **XIII week** | Lect. | lipoproteins: VLDL, LDL, IDL, HDL and chilomicrones, their characterization and role in metabolism . | **1** | **1** |
| Pract. | lipoproteins: VLDL, LDL, IDL, HDL and chilomicrones, their characterization and role in metabolism . | **2** | **1** |
| **XIV week** | Lect. | Hypercholesterolemias,atherosclerosis, mechanism of athersoclerosis development. | **1** | **1** |
| Pract. | Hypercholesterolemias,atherosclerosis, mechanism of athersoclerosis development. Treatment | **2** | **1** |
| **XV week** | Lect. | Hypercholesterolemias,atherosclerosis, mechanism of athersoclerosis development. Treatment. | **1** | **1** |
| Pract. | Enzymes, used in diagnosis of different cardiovascular pathologies. | **2** | **1** |
| **XVI week** | Lect. | Enzymes, used in diagnosis of different cardiovascular pathologies. | **1** | **1** |
| Pract. | Isoenzymes role in differential diagnosis of the CV diseases. | **2** | **1** |
| **XVII- XVIII**  **week** | **Final Exam** | | **2** |  |
| **XIX-XXweek** | **Additional exam** | |  |  |