

<b>Study program:</b> Integrated academic studies in Pharmacy			
<b>Type and level of the study program:</b> Integrated academic studies			
<b>Course title: Clinical biochemistry (PhIV-CBCH)</b>			
<b>Teacher:</b> Karmen M. Stankov, Ljiljana N. Andrijević, Jasmina N. Katanić, Jelena D. Stojčević-Maletić, Bojan G. Stanimirov, Vanesa Z. Sekeruš			
<b>Course status:</b> Elective			
<b>ECTS Credits:</b> 3			
<b>Condition:</b> General biochemistry, Medical biochemistry (I colloquium)			
<b>Course aim:</b> The goal of teaching in clinical biochemistry is to provide an overview of specialized biochemical methods used in clinical biochemistry as a diagnostic means and to prepare students for prospective work in biochemical laboratories.			
<b>Expected outcome of the course:</b> Knowledge of biological phenomena at the molecular level and understanding the basis of pathophysiology of many diseases. Knowledge of specific biochemical processes of different tissue types and organ systems and a network of integrated and interconnected biochemical pathways within organism as a whole. Biochemical basis of functional testing of individual organs and systems of organs. Proper sampling of biological material for biochemical analysis. The choice of biochemical analysis and appropriate use of certain analytical procedures and instruments in specialized biochemical laboratories. Appropriate interpreting the results of biochemical analysis, knowledge of normal and reference values, measurement units. Analysis of the metabolism of the most important body constituents based on measurements in biological samples.			
<b>Course description</b>			
<i>Theoretical education</i>			
1. Introduction to Clinical Biochemistry. 2. Regulation of blood glucose levels. Diabetes mellitus, classification, non glucose metabolic consequences of the lack of effects of insulin. Acute and chronic complications of diabetes mellitus. 3. Total plasma proteins, hypo and hyperproteinemia. Individual plasma proteins. Proteinuria, proteinuria types. Primary disorders of protein metabolism. Secondary disorders of protein metabolism. 4. Transport of lipids, exogenous and endogenous time. The role of the liver and fat tissue in lipid metabolism. Disorders of lipoprotein metabolism. 5. Control of water intake disorders. Dehydration, the deficit of water and sodium and biochemical aspects of dehydration. Hyperhydration, the excess water and sodium, and biochemical aspects of hiperhydration. 6. Disorders of potassium metabolism, disorders in excess potassium – hyperkalemia, disorders in the absence of potassium - hypokalemia. 7. Respiratory system and its role in the regulation of pH. Elimination of CO <sub>2</sub> from the tissues and lungs. Isohydric and chloride shift. Role of kidneys in the regulation of pH. Acid excretion, and change of H and Na ions. NH <sub>4</sub> <sup>+</sup> excretion. Bicarbonate reabsorption, disorders in acid-base balance. Metabolic acidosis - compensatory mechanisms. Metabolic alkalosis - compensatory mechanisms. Respiratory acidosis and alkalosis and compensatory mechanisms. Acid-base parameters - definitions. 8. Factors affecting the change in enzyme levels in the plasma. Entering of enzymes in the blood, the release of enzymes from cells. The change of enzyme level as a consequence of reduced synthesis. Choice of enzyme tests, enzyme profile in serum in various diseases. Isoenzymes. Enzymopathies. Enzymes in serum in myocardial infarction and liver disease and other diseases (bone, pancreas, prostate, muscles). 9. Inorganic phosphate. Hyper and hypophosphatemia. Magnesium and regulation of magnesium metabolism, and hyper/hypomagnesemia. 10. Iron in serum. Total and free iron bonding capacity. Disorders of iron metabolism, iron deficiency. Alpha and beta Thalassemia. 11. Investigation of liver function. Investigation of the excretory function - for endogenous products, for exogenously entered compounds. Investigation of metabolic liver function. Investigation of metabolic functions of liver metabolism of proteins, lipids and glycid. Testing RES function. Proving syndrome necrosis of hepatocytes. Biochemical aspects of liver disease. Jaundice and biochemical aspects of alcoholism. 12. Examination of kidney function. Examining glomerular functions. Renal and extrarenal asothemia. Examining functions of tubules. Tubular reabsorption. Tests for examination of tubular reabsorption.			
<i>Practical education: exercises, other forms of education, research related activities</i>			
1. Introduction. Statistical evaluation of the use value of the results of clinical biochemical analysis. Laboratory quality control. Clinical quality control and clinical correlation of the results of biochemical analysis. 2. Specialist clinical biochemical analysis (glucose, total protein, cholesterol, triglycerides, urea etc.). Basic principles of operation and use of biochemical auto analysers. 3. Specialist methods for determination of protein. Determination of the concentration of certain proteins in the serum electrophoresis and turbidimetry. 4. Specialist Hematology-biochemical analysis. Evidence of pathological hemoglobin. Testing functions hemostatic mechanism. 5. Specialist methods of hormone determination. Biochemical methods. Immunometric methods. 6. Specialist methods of biochemical tests of kidney function. Determination of clearance and other methods of functional examination of kidneys. 7. Urgent laboratory methods for testing emergency medical condition. Determination of electrolytes and acid-base state of the organism.			
<b>Literature</b>			
<i>Compulsory</i>			
1. Lieberman M, Marks A. Mark's Basic Medical Biochemistry – a clinical approach, 4th ed. Philadelphia:Lippincott Williams & Wilkins, 2013.			
<i>Additional</i>			
1. Burtis CA, Ashwood ER, Burns DE. Tietz Textbook of Clinical chemistry and molecular diagnostics,5th ed. St. Louis: Saunders Elsevier, 2012.			
<b>Number of active classes</b>			<b>Other:</b> -
Lectures: 30	Practice: 15	Other types of teaching: -	
<b>Teaching methods:</b> lectures for small groups with the use of multimedia didactic materials; practical work in medical laboratories.			

<b>Student activity assessment (maximally 100 points)</b>			
<b>Pre-exam activities</b>	<b>points</b>	<b>Final exam</b>	<b>points</b>
Lectures	10	Written	15
Practices	40	Oral	35
Colloquium	-	.....	
Essay	-		