Collegium Medicum im. L. Rydygiera w Bydgoszczy
DEPARTMENT OF MEDICAL BIOLOGY AND BIOCHEMISTRY
MEDICAL BIOCHEMISTRY DEPARTMENT

KEYPOINTS FOR BIOCHEMISTRY ENTRANCE TESTS - II semester 2023/2024
FOR THE MEDICAL STUDENTS

Tutorial 1. - SELECTED PROPERTIES OF MONOCARBOHYDRATES

- structural formulas of glucose, fructose, galactose, ribose (for hexoses pyranose and furanose forms), monosaccharide structure in solutions with neutral, alkaline and strongly acidic pH
- chemical principle of the reaction: with fuchsin, Fehling, with Benedict's reagent, with Nylander's reagent, with Tollens' reagent, with picric acid, Molisch, Seliwanoff's test, Tollen's phloroglucinol test for pentoses, orcinol (Bial's test), detection of deoxyribose, with methylene blue, effect of various conditions on the reduction reactions
- physiological functions of pentoses and hexoses
- reactions of the glycolysis pathway, substrate-level phosphorylation, regulation of glycolysis
- glycolysis under anaerobic conditions

Tutorial 2. - SELECTED PROPERTIES OF DISACCHARIDES AND POLYSACCHARIDES

- structural formulas of sucrose and lactose; structure of starch and glycogen
- the principle of the Molisch, Barfoed, Seliwanow, Fehling reactions, the reaction of starch with iodine, definition of osazones
- structure, role and examples of complex carbohydrates
- synthesis of lactose in the human body
- glycogen synthesis and degradation, including glycogen storage diseases

Tutorial 3. - GLUCOSE TOLERANCE TEST

- the principle of enzymatic determination of glucose in blood
- principle of the OGTT test (oral glucose tolerance test)
- structure and role of sialic acids
- course and regulation of gluconeogenesis
- hormonal regulation of blood glucose levels
- definition of diabetes mellitus type I and II, diagnostics of diabetes (blood glucose level, HbA1c, fructosamine, results of the OGTT test)

Tutorial 4. - MEDICAL ASPECTS OF DISORDERS IN METABOLIC PATHWAYS OF CARBOHYDRATES

- Issues described in the provided scientific articles

Tutorial 5. - BIOLOGICAL OXIDATION

- chemical principle for determining the activity of ceruloplasmin by the Ravin method
- the course of the respiratory chain, inhibitors and uncouplers of oxidative phosphorylation
- energy-rich compounds, total yield of ATP from glucose and fatty acid oxidation
- reactive oxygen species, antioxidant defense – antioxidant enzymes and their reactions, non-enzymatic antioxidants

Tutorial 6. - PHYSICO-CHEMICAL PROPERTIES OF LIPIDS

- chemical principle of the acrolein test, fat saponification, Kreis test for aldehyde rancidity
- structure of basic saturated and unsaturated fatty acids
- fatty acid synthesis
- β-oxidation of fatty acids
- metabolism of ketone bodies

Tutorial 7. - LIPID PROFILE

- the principle of enzymatic determination of triacylglycerols and serum cholesterol
- structure of phospholipids and cholesterol
- synthesis and regulation of cholesterol synthesis
- lipoproteins and their role in the transport of cholesterol in the body
- diagnostic significance of the level of lipoproteins in the blood serum
- dyslipoproteinemias

Tutorial 8. - QUALITATIVE AND QUANTITATIVE ANALYSIS OF THE URINE OF A HEALTHY PERSON

- the chemical principle of the reaction of creatinine detection by the Weyl and Jaffe method, the formation of indican in the human body and its detection by the Deniges method, determination of the activity of amylase in urine by the Winslow method
- the composition of the urine of a healthy person
- nitrogen components of the urine of a healthy person and the reactions which are their source in the human body
- biosynthesis of non-nutritionally essential amino acids in the human body
- urea cycle

Tutorial 9. - QUALITATIVE AND QUANTITATIVE ANALYSIS OF URINE IN SELECTED DISEASES

- chemical principle of determination in urine: proteins by the Exton turbidimetric method, Hb in benzidine reaction, ketone bodies by the Rother and Legal methods, glucose by Benedict's reagent
- urine analysis in selected pathological conditions - diabetes, kidney disease, lead poisoning
- nomenclature and chemical formulas of major and atypical purines and pyrimidines
- synthesis of purines and pyrimidines and regulation of these processes
- products of catabolism of purine and pyrimidine bases
- selected disorders of purine catabolism

Tutorial 10. - SELECTED DIAGNOSTIC PARAMETERS IN LIVER DISEASES

- principle of kinetic methods to measure the activity of LDH, ALT, AST (NADH-linked methods)
- diagnostic significance of LDH, ALT and AST activity in blood serum
- heme synthesis and catabolism, regulation of these processes
- transport of direct and indirect bilirubin and their diagnostic importance
- enterohepatic circulation of bile pigments
- hyperbilirubinemias - differentiation of jaundice types
- liver metabolic role
- the role of the liver in detoxification processes

Tutorial 11. - SELECTED DIAGNOSTIC PARAMETERS IN KIDNEY DISEASES

- the diagnostic significance of the determination of urea, creatinine and uric acid levels, as well as the activity of GGT and ALP in the blood serum
- glomerular filtration in the kidney, the concept of clearance
- biochemical function of the kidney
- the kidney's role in the regulation of blood pressure
- the role of the kidney in hematopoiesis

Tutorial 12. - MEDICAL ASPECTS OF DISORDERS OF METABOLIC PATHWAYS IN SELECTED ORGANS

- Issues described in the provided scientific articles