

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

KEYPOINTS FOR TESTS (COLLOQUIA)- BIOCHEMISTRY - II SEMESTER 2024/2025
FOR MEDICAL STUDENTS

Test 3 keypoints:

1. Carbohydrates of physiological importance - chemical formula, structure, role in the body. Glucose as a source of ATP - reactions of the glycolysis pathway, substrate-level phosphorylation, regulation of glycolysis. Glycolysis under anaerobic conditions (Cori cycle). Entering fructose and galactose into glycolytic pathway. Disorders of fructose and galactose metabolism.
2. The course of oxidative decarboxylation of pyruvate and its regulation. Course and regulation of gluconeogenesis. Hormonal regulation of a blood glucose level - the role of insulin, glucagon, adrenaline.
3. Glycogen synthesis and degradation, including diseases resulting from disorders of glycogen metabolism. Hormonal regulation of glycogen metabolism.
4. The course of the pentose phosphate pathway, its special role in the body, disorders resulting from the lack of NADPH synthesis. Main red blood cell metabolic pathways. Red blood cell glycolysis (bisphosphoglycerate pathway).

Test 4 keypoints:

1. The course of the tricarboxylic acid cycle – the cycle energy gain. Mitochondrial transmembrane transport systems and NADH transport shuttles. The course of the respiratory chain, inhibitors and uncouplers of oxidative phosphorylation. Cell bioenergetics - energy-rich compounds, complete balance of glucose oxidation. Generation of reactive oxygen species. Cell damage caused by reactive oxygen species. Antioxidant defense.
2. The role of carnitine in the transport of fatty acids. β -oxidation of saturated and unsaturated fatty acids. Energy gain of β -oxidation. β -oxidation of fatty acids with an odd number of carbon atoms in the chain. Metabolism of ketone bodies.
3. Lipids of physiological importance - chemical formula, structure, role in the body. Synthesis and elongation of fatty acids, formation of unsaturated bonds. The role of arachidonic acid - the synthesis of eicosanoids (prostaglandins, prostacyclins, thromboxanes and leukotrienes). Synthesis of glycerolphospholipids and sphingolipids.
4. Lipoproteins. Transport of cholesterol in the blood by lipoproteins. Dyslipoproteinemias. Cholesterol synthesis and regulation of this process in the human body.

Test 5 keypoints:

1. Biosynthesis of non-nutritionally essential amino acids in the human body. Synthesis and role of biogenic amines. The most important enzymes involved in the catabolism of amino acids and the removal of amino nitrogen.
2. Urea cycle. Amino acid catabolism. Glucogenic and ketogenic amino acids. Selected metabolic disorders of amino acid catabolic pathways.
3. Synthesis of biologically important, specialized products from amino acids. Metabolism of one-carbon residues. The role of one-carbon residues in the biosynthesis of biologically important compounds.
4. Nomenclature and structure of major and atypical purine and pyrimidine bases. Synthesis of purines and pyrimidines and regulation of these processes. Catabolism of purine and pyrimidine bases. Selected diseases related to disorders of purine catabolism.

Test 6 keypoints:

1. Liver as the body's metabolic center. The role of the liver in detoxification processes. The role of the liver in maintaining normal blood glucose levels.
2. Heme synthesis and catabolism, regulation of these processes. Transport of bilirubin in the blood plasma, role of the liver in conjugation of bilirubin. Enterohepatic circulation of bile pigments. Hyperbilirubinemias. Diagnostic significance of total bilirubin, differentiation of bilirubin into indirect (free) and direct (conjugated). Diagnostic importance of direct and indirect bilirubin.
3. Biochemical function of the kidneys. Diagnostic significance of urinary excreted metabolites. Hormone classification. The most important hormones influencing the metabolism of carbohydrates, lipids and proteins in the cells of muscle, liver and adipose tissue. Synthesis of thyroid hormones.
4. Metabolic profile of basic organs and tissues. Summary of carbohydrate, lipid and amino acid metabolism in cells of the liver, brain, skeletal muscle, heart muscle and kidney. Metabolic links between the metabolism of carbohydrates, lipids and amino acids. Compounds and reactions that are the source of ATP for skeletal muscle cells at rest and during exercise - sprint run and marathon. Metabolic changes that occur during fasting and postabsorptive state. Metabolic changes accompanying type 1 and 2 diabetes mellitus.