APPROVED
at the Chair meeting of 28.08.24, minute no.1,
Head of the Biochemistry and Clinical Biochemistry Chair,
MD., professor, Tagadiuc Olga _____

**PLAN OF THE THEORETICAL AND PRACTICAL CLASSES
IN CLINICAL BIOCHEMISTRY, FACULTY MEDICINE II, THIRD YEAR, SPRING BATCH,
2024-2025 ACADEMIC YEAR, FALL SEMESTER**

Fall semester (6th), third year			
N	**Data**	**Theoretical classes**	**Practical lessons**
1	02-06.09	Clinical laboratory diagnosis	Laboratory clinical diagnosis: purpose, objects of analysis and stages. Factors that influence the results of the analyses: a) internal factors (associated with the patient) – age, sex, race, physiological state; b) external factors – collection time, food, smoking, stress, medications. The pre-analytical stage of clinical laboratory diagnosis: plan and request of the investigation, preparation of the patient, sampling, processing, storing and transportation of the biological samples. Analytical stage of clinical laboratory diagnosis. The main laboratory analysis methods – spectrophotometry, nephelometry, turbidimetry, luminescence, ELISA, etc. – general principles. Sensitivity, specificity and repeatability of laboratory methods – their importance. How to express and calculate results. Post-analytical stage of clinical laboratory diagnosis – evaluation of the veracity of the results obtained and their validation. Clinical value of results – reference values. Interpretation of results. The causes of errors at different stages of clinical laboratory diagnosis and how to prevent them.
2	09-13.09	Blood biochemistry. Proteins, enzymes and non-protein nitrogenous compounds	Functions of plasma proteins. Characteristics of the main plasma proteins: albumins, fibrinogen, globulins (transferrin, ferritin, ceruloplasmin, haptoglobins, immunoglobulins). Protein dosing and separation methods. Interpretation of major abnormalities observed in serum protein electrophoresis. Serum proteinogram. Pathological changes of plasma proteins. Acute phase proteins of inflammation. Proteins - tumor markers. Plasma enzymes. Functional classification. Secretory, indicator, excretory enzymes. The clinical-diagnostic value of enzyme determination. Serum

			enzymes in liver, heart, GI, muscle, bone, kidney diseases. The value of enzymes in malignant diseases. Nitrogenous non-protein compounds of the blood plasma. Residual nitrogen. Its fractions in norm and pathology. Mechanisms of water retention and production of azotemia.
3	16-20.09	haemostasis	Notions of haemostasis. Its role and stages. Primary haemostasis: the intervention of the vascular component (the role of vasoconstriction, vascular endothelium and subendothelial structures); the structural and functional particularities of platelets. The role of platelets in coagulation and fibrinolysis. Quantitative (thrombocytopenia, thrombocytosis and thrombocythemia) and qualitative (hereditary and acquired) abnormalities of platelets; Von Willebrand factor – structure, functions. Von Willebrand's disease. Exploration of primary haemostasis: bleeding time, platelet aggregation tests and von Willebrand factor exploration. Secondary haemostasis: coagulation factors and cofactors; the extrinsic and intrinsic pathway of coagulation; coagulation exploration: prothrombin time, partially activated thromboplastin time, thrombin time, clotting time, fibrinogen dosage; genetic abnormalities of changes in coagulation factors. Anticoagulant mechanisms (antithrombin III; heparin cofactor II, tissue factor-mediated pathway inhibitors; protein Z and protein Z inhibitors); protein C system: protein C, protein S, thrombomodulin and endothelial protein C receptor). Fibrinolysis: general diagram of the fibrinolytic system; plasminogen and plasmin; fibrinolysis activators and inhibitors; exploration of fibrinolysis: the lysis time of the diluted blood clot, the dosage of D-dimers. Genetic and acquired disturbances of fibrinolysis. Peculiarities of haemostasis in various physiological and pathological conditions (in haemorrhagic syndromes of newborns, haemostasis in pregnancy, in neoplasms, in kidney diseases, disseminated intravascular coagulation). Thrombosis. Laboratory exploration of thrombosis. Notes on anticoagulant and antiplatelet therapy
4	23-27.09	Hydro-electrolytic and acid-base balance	Pathochemistry of quantitative and qualitative disturbances of water and electrolyte homeostasis. The role, amount and distribution of water and electrolytes in the body. The forces that coordinate the movement of water and electrolytes between compartments. Control of water homeostasis. Sodium homeostasis control. Disorders of water and sodium metabolism. Potassium homeostasis. Disorders of potassium metabolism (hypo and hyperkalemia). Diagnosis of hydro-electrolytic disorders and the pathochemical principles of treatment. Physiological and biochemical mechanisms of acid-base balance regulation. Parameters of acid-base

			balance, their physiological and pathological variations (age, time of day, phases of digestion, state of exertion). Metabolic and respiratory acidosis and alkalosis
5	30.09- 04.10	Pathochemistry and laboratory exploration of renal pathology	Elements of renal structure. Renal functions. Determinants of glomerular filtration. Pathochemistry of quantitative and qualitative disorders of the glomerular filtrate. Exploration of glomerular filtration: Glomerular filtration rate (GFR), creatinine, plasma urea, Cystatin C. Interpretation of laboratory results. Tubular functions. Pathochemistry of tubular functional -morphological disorders. Mechanisms of water reabsorption, concentration and dilution of urine. Exploring tubular functions: urinary excretion of amino acids and glucose; urine concentration/dilution tests; urine acidification tests. Proteinuria: prerenal, renal, postrenal. Causes, laboratory differentiation. Pathochemistry of nephrological syndromes: renal tubular acidosis, Alport syndrome; nephrotic syndrome; nephritic syndrome; acute renal failure (ARI) and chronic (CRI); diabetic, toxic and medicinal nephropathy. Diagnosis of renal dysfunctions: "Renal investigations" profile in the blood. The chemical composition of urine. Abnormal components of urine. Urinary sediment. Exploration of the endocrine-humoral and metabolic functions of the kidney. Renal lithiasis. Chemical composition of stones. Causes and stages of lithogenesis, precipitating factors. Laboratory exploration and principles of pathogenetic treatment. The pathogenetic principles of treatment of renal dysfunctions.
6	07-11.10	Biochemistry of bone tissue. Calcium and phosphate homeostasis	Calcium and phosphate homeostasis. Mechanisms involved in phospho-calcium homeostasis. Hormonal regulation. Disorders of calcium and phosphate metabolism. Investigation of phospho-calcium metabolism disorders. Bone as a biological material. Bone tissue biochemistry. Proteins, lipids, nucleic acids, organic acids, enzymes. Markers of bone formation. Markers of bone resorption. Metabolic bone diseases. Osteoporosis. Classification of osteoporotic syndromes.
7	14-18.10	Laboratory investigation of plasma lipids and lipoproteins. Primary and secondary dyslipidemias	**Concluding test 1**
8	21-25.10	Disorders and explorations of carbohydrate metabolism	Plasma lipoproteins – structure, role, separation methods. Apoproteins, proteins, enzymes and receptors involved in lipoprotein metabolism. Major lipoproteins (chylomicrons, VLDL, LDL, HDL). Minor and pathological lipoproteins (IDL, LP(a), LPX, beta – VLDL). Determination of plasma lipids and lipoproteins – triglycerides, cholesterol, LDL – cholesterol, HDL – cholesterol, apoproteins. Factors that can

			influence lipid parameters. Isolated hypercholesterolemia (polygenic hypercholesterolemia, familial hypercholesterolemia, sitosterolaemia, autosomal dominant hypercholesterolemia). Isolated hypertriglyceridemia (diabetic dyslipidaemia, familial hypertriglyceridemia, familial hyperchylomicronaemia). Combined hyperlipidaemias (combined familial hyperlipidaemia, metabolic syndrome hyperlipidaemia, hepatic lipase deficiency). Hypolipidemias (α - and ß – hypobetalipoproteinaemia). Decrease in HDL – cholesterol (familial hypoalphalipoproteinemia, Tangier disease, LCAT deficiency). Increase in HDL – cholesterol (PTEC deficiency). Biochemical principles of hyperlipidaemia treatment. Atherosclerosis. The role of lipoproteins in atherosclerosis. Atherogenic dyslipidaemia.
9	28.10- 01.11	Pathochemistry of the thyroid gland	Disorders and explorations of carbohydrate metabolism
10	04-08.11	Steroid hormones (adrenal and sex) – biochemical aspects and laboratory investigations	Peculiarities of the metabolism of thyroid hormones (T_3 and T_4). Classification of thyroid disorders according to the level of secretion, type of glandular hypertrophy and etiology. Paraclinical thyroid examination: evaluation of the functional state of the thyroid gland; thyroid autoimmunity tests; special serum markers; biochemical constants in serum; radioiodine uptake (RIC); dynamic exploration; imaging exploration of the thyroid – correlations with laboratory biochemical methods (generalities). The investigation algorithm of thyroid function. Hyperthyroidism: definition; the causes and pathogenic mechanisms of excess production of thyroid hormones; metabolic changes and clinical manifestations of hyperthyroidism; paraclinical diagnosis of hyperthyroidism; principles of treatment. Hypothyroidism: definition; the causes and pathogenic mechanisms of thyroid hormone production deficiencies; metabolic changes and clinical manifestations of hypothyroidism; paraclinical diagnosis of hypothyroidism; principles of treatment. Thyroid cancer. Evaluation of thyroid nodules.
11	11-15.11	Pathochemistry and diagnosis of hepatobiliary diseases	Steroid hormones: structure, biosynthesis, regulation of secretion, transport, mechanism of action, effects, metabolism. Pathochemistry of adrenocortical insufficiency - Addison's disease: the causes and pathogenic mechanisms of the deficiency of adrenocortical hormone production, metabolic changes and clinical manifestations, paraclinical diagnosis, principles of treatment. Pathochemistry of

			Cushing's syndrome: causes and pathogenic mechanisms of excess production of adrenal cortical hormones, metabolic changes and clinical manifestations, paraclinical diagnosis, principles of treatment. Performing functional tests (test with Dexamethasone, Synacthen, etc.) and interpreting their results, principles of treatment. Biochemical mechanisms of polyglandular autoimmune syndromes. MEN 1 and MEN 2 syndromes. Adrenogenital syndromes and the biochemical mechanisms involved in their development. Pathochemistry and diagnosis of sexual gland disorders. Hypogonadism – biochemical mechanisms and their clinical relevance. Pathochemistry of primary and secondary infertility. Early ovarian failure and metabolic changes associated with menopause. Laboratory diagnosis of sexual gland disorders.
12	18-22.11	Biochemistry of nerve transmission	Pathochemistry and diagnosis of functional-morphological disorders of the stomach and intestine (malabsorption syndrome, steatorrhea, diarrhea and hemorrhage). Pathochemistry and diagnosis of acute and chronic inflammatory diseases of the pancreas and pancreatic disorders in systemic diseases. Liver enzymes. Classification, representatives, role and physiological variations. Mechanisms of dysenzymia in liver diseases. Pathological changes of liver enzymes in liver and extrahepatic diseases. Diagnostic, prognostic and treatment monitoring value of liver enzymes. The role of the liver in the integration of metabolism and maintaining the homeostasis of the human body. Methods of investigating the integrative role of the liver and markers of metabolic, hydrosaline, acid-base, fluid-coagulant balance, etc. in liver diseases. Mechanisms of bile excretion and regulation of this process. Disorders of bile excretion and associated pathologies. Methods of investigation of biliary excretion and markers of diagnostic interest. General and hepatic detoxification mechanisms. Stages of detoxification in the liver (oxidative and conjugation). Hepatoxicity associated with detoxification mechanisms, including drug hepatotoxicity. Markers of hepatotoxicity. Biochemical syndromes specific to liver diseases. Laboratory markers of each syndrome and their diagnostic value. Markers of cancerous diseases of the gastrointestinal tract, pancreas and liver.

13	25-29.11		Peculiarities of the chemical and metabolic composition of nerve cells. The structure of synapses and the peculiarities of communication between nerve cells. Structure and classification of neurotransmitters. Cholinergic, monoaminergic, aminoacidergic, peptidergic, purinergic neurotransmitter substances. Synthesis, storage, release of neurotransmitters, removal of mediators from the synaptic cleft, synaptic receptors, biochemical mechanisms of action of neurotransmitters at the postsynaptic level. Pathologies associated with disturbances in the synthesis, release or action of different neurotransmitters, or affecting their receptors (Parkinson's disease, Alzheimer's disease, schizophrenia, depression, anxiety, migraine, myasthenia gravis).
14	02-06.12		**Concluding test 2**
15	09-13.12		**Evaluation of students individual work**

Note: Olga Tagadiuc, MD, professor, is responsible for the theoretical classes at the Faculty of Medicine nr 2, spring batch. Duration of the theoretical class - 2 hours, practical lesson - 2 hours.