Azerbaijan medical university
Department of Biological Chemistry
On the subject of clinical biochemistry
EMPLOYEE TRAINING PROGRAM
(SYLLABUS)

"I CONFIRM"
ead of the Department of Biological Chemistry
prof. Azizova G.İ.
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SYLLABUS

CLINICAL BIOCHEMISTRY LECTURE AND LABORATORY CLASS CALENDARPLANS. QUESTIONS FOR PREPARING FOR CLASSES, COLLOQUIUMS AND EXAMS. CLINICAL BIOCHEMISTRY PRESENTATION TOPICS

Code of Subject:	**2406.02**
Type of Subject:	**Mandatory**
Teaching Term of Subject:	**XI (Public health faculty)**
Subject Credit:	**4**
Form of Teaching the Subject:	**Visual**
Language of Teaching Subject:	**Azerbaijcan, Russian, English**
Teacher Giving the Lesson:	
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BAKU – 2021

The program was developed by the staff of the Department of Biological Chemistry (edited by the head of the department, Prof. GI Azizova).

The program is for VI year students of the Faculty of Public Health.

Calendar-thematic plan of laboratory classes on pathological biochemistry for 6th year students of the Faculty of Public Health in the autumn semester of the 2021-2022 academic year

№	*The subject of the lessons*	*Hour*
1	Familiarity with the group, calendar-topic plan and free work. Pathobiochemistry and research methods of carbohydrate metabolism. Metabolic aspects of diabetes. Determination of blood glucose and glycohemoglobin. "Sugar load" test.	7
2	Pathobiochemistry and research methods of lipid metabolism. Determination and diagnostic value of total lipids, cholesterol and fractions, triglycerides in the blood. Electrophoresis of blood serum lipoproteins. Pathobiochemistry of protein metabolism and its research methods. Determination and diagnostic value of total protein and albumin in the blood. Electrophoresis of blood serum proteins.	7
3	Colloquium: Pathobiochemistry of carbohydrate, protein and lipid metabolism. Pathobiochemistry and research methods of connective tissue. Determination and diagnostic value of sialic acids, seroglycoids, C-reactive protein, rheumatoid factor and O-antistreptolysis in blood.	8
4	Pathobiochemistry and research methods of bone tissue. Determination and diagnostic value of calcium, phosphorus, magnesium, hydroxyproline in blood serum and urine.	7
5	Pathobiochemistry and research methods of muscle tissue. Determination and diagnostic value of the activity of isoenzymes lactate dehydrogenase and creatine kinase in blood serum. Colloquium: Pathobiochemistry of connective, bone and muscle tissue.	7
6	Pathobiochemistry and research methods of water-salt metabolism. Na +, K + determination and clinical significance.	7
7	Colloquium. Acceptance of free work.	7

Total: 50 hours

Calendar-thematic plan of lectures on pathological biochemistry for VI year students of the Faculty of Public Health in the autumn semester of the 2021-2022 academic year

№	**The subject of the lessons**	*Hour*
1	Introduction. The role of exogenous and endogenous factors in the development of diseases.	2
2	Pathobiochemistry of metabolic processes (carbohydrates, lipids and proteins).	2
3	Pathobiochemistry of connective and bone tissues.	2
4	Pathobiochemistry of muscle and nerve tissues.	2
5	Pathobiochemistry of water-salt metabolism.	2

Total: 10 hours

COLLİQUİUM AND EXAM QUESTIONS FROM CLINICAL BIOCHEMISTRY FOR VI YEAR STUDENTS OF THE FACULTY OF PUBLIC HEALTH

THE ROLE OF EXOGENIC FACTORS IN DISEASE

The role of foreign chemicals (xenobiotics) in the development of diseases. General principles of intracellular pathways and metabolism of foreign chemicals. Effects of xenobiotics on liver and kidney tissue.

Situations caused by physical factors. Biochemical mechanisms of damaging effects of ultraviolet and ionizing radiation. Laser beams. Radiation sickness. Injury. Thermal burns, biochemical mechanisms of burn disease.

The role of biological factors in the pathogenesis of diseases. Effects of microorganisms. Effects of viruses.

PATHOBIOCHEMISTRY OF CARBOHYDRATE METABOLISM

Regulation of carbohydrate metabolism. Hyper- and hypoglycemia. Hereditary and acquired disorders of carbohydrate metabolism (glycogenosis, galactosemia, pentosuria, fructosuria, etc.). Diabetes.

PATHOBIOCHEMISTRY OF LIPID METABOLISM

Regulation and disorders of lipid metabolism (obesity, atherosclerosis, biliary disease, fatty infiltration of the liver). Hypo- and hyperlipidemias, dyslipoproteinemias. Congenital defects of blood lipoproteins. Atherosclerosis: risk factors, regression, complications. Biochemical bases of diagnosis, treatment and prevention of atherosclerosis.

PATHOBIOCHEMISTRY OF PROTEIN METABOLISM

Disorders of protein metabolism (hypo-, hyper-, para- and dysproteinemia). Hereditary disorders of amino acid metabolism (phenylketonuria, albinism, tyrosinosis, alkaptonuria, etc.). Congenital disorders of porphyrin, bilirubin, purine and pyrimidine metabolism (porphyria, xanthinuria, gout, Les-Nihan syndrome, orotaciduria, jaundice). Mucopolysaccharidoses and mucolipidoses.

PATHOBIOCHEMISTRY OF CONNECTIVE TISSUE

Chemical composition and metabolic properties of connective tissue: intercellular organic matrix, collagen, elastin, proteoglycans, glucosaminoglycans. Biosynthesis and catabolism of proteoglycans. Non-collagen structural glycoproteins. Systemic diseases of connective tissue. Changes in connective tissue during aging and pathological processes.

Theories about aging. Aging of physiological systems of the body. Regulation of metabolism and function during aging. Biochemical aspects of biological age and life extension. Apoptosis (apoptosis, immune system and oncological diseases). Principles of correction of cell apoptosis.

PATHOBIOCHEMISTRY OF BONE TISSUE

Bone tissue: chemical composition, metabolic properties. Regulation of metabolic processes in bone tissue (calcitriol, calcitonin, parathormone). Pathologies of bone tissue (osteoporosis, osteo-, chondrosarcomas).

PATHOBIOCHEMISTRY OF MUSCLE TISSUE

Chemical composition, morphofunctional and metabolic properties of muscles. Biochemistry of muscle contraction. ATF and cratinphosphate. Extractive nitrogenous and non-nitrogenous substances of muscles. Biochemical mechanisms of changes observed in muscles during myocardial infarction, cardiomyopathies and avitaminosis E.

PATHOBIOCHEMISTRY OF NERVE TISSUE

Chemical composition of nerve tissue. Features of metabolism and energy metabolism in nerve tissue. The structure of the nerve fiber. Nerve impulse: calm and action potential. Nerve impulse transmission: cholinergic and adrenergic synapses. Substances that affect the transmission of nerve impulses. Neuropeptides and mediators. Biochemical mechanisms of sleep and memory. Cerebrospinal fluid. Hematoencephalic barrier. Molecular mechanisms and diagnosis of neuropsychiatric diseases.

PATHOBIOCHEMISTRY OF WATER-SALT METABOLISM

The role, amount and distribution of water in the body. The body's need for water. Ways of excretion of water from the body. Disorders of water metabolism: hypohydration and hyperhydration. Edemas. Demand for mineral salts. Disorders of mineral metabolism. Disorders of sodium and potassium metabolism. Microelements.

IN THE AUTUMN SEMESTER OF THE 2021/2022 ACADEMIC YEAR QUESTIONS FROM CLINICAL BIOCHEMISTRY

LESSONS I
Pathobiochemistry of carbohydrate metabolism

1. Mechanisms of regulation of carbohydrate metabolism.
2. Disorders of digestion and absorption of carbohydrates.
3. Hypo- and hyperglycemia
4. Disorders of gaining intermediate metabolism of carbohydrates.
5. Fructosuria and fructose intolerance. Galactosemia.
6. Glycogenoses.
7. Glycosidoses.
8. Metabolic disorders in diabetes.
9. Determination and clinical significance of blood glucose. "Sugar load" test.
10. Determination and clinical significance of glycohemoglobin in the blood.

LESSONS II
Pathobiochemistry of lipid metabolism

1. Regulation of lipid metabolism.
2. Disorders of lipid digestion and intestinal absorption.

3. Disorders of lipid transport to tissues. Hyperlipoproteinemia.
4. Fatty hepatic dystrophy.
5. Pathology of fat depots.
6. Pathologies of cholesterol metabolism (atherosclerosis, gallstone disease).
7. Hereditary lipidoses.
8. Determination and clinical significance of total lipids in blood serum.
9. Determination and clinical significance of triglycerides in blood serum.
10. Determination and clinical significance of cholesterol and its fractions in blood serum.

Pathobiochemistry of protein metabolism

1. Disorders of intermediate metabolism of amino acids.
2. Hereditary disorders of amino acid metabolism.
3. Hereditary disorders of porphyrin synthesis.
4. Neutralization and excretion of bile pigments.
5. Hereditary defects of purine and pyrimidine metabolism.
6. Hypo- and hyperproteinemia - causes.
7. Determination and clinical significance of total protein in blood serum.
8. Determination and clinical significance of albumin in blood serum.
9. Research and diagnostic significance of protein spectrum in blood serum.
10. Fractionation of blood serum proteins by disk electrophoresis.

LESSONS III
Pathobiochemistry of connective tissue

1. Chemical composition of connective tissue.
2. Metabolic properties of connective tissue.
3. Biosynthesis and catabolism of proteoglycans.
4. Systemic diseases of connective tissue.
5. Changes in the body during aging.
6. Theories of aging.
7. Features of metabolism in the body during aging.
8. Proherias.
9. Determination and clinical significance of sialic acids and seroglycoids in blood serum.
10. Determination and clinical significance of CRP, RF and ASO in blood serum.

LESSONS IV
Pathobiochemistry of bone tissue

1. Chemical composition of bone tissue - minerals.
2. Organic matrix of bone tissue.
3. Cellular elements of bone tissue.
4. Mineralization of bone tissue.
5. Regulation of metabolism in bone tissue.
6. Pathologies of bone tissue.
7. Determination and clinical significance of serum calcium.
8. Determination and clinical significance of phosphorus in blood serum.
9. Determination and clinical significance of magnesium in blood serum.
10. Determination and clinical significance of hydroxyproline in blood serum.

LESSONS V
Pathobiochemistry of muscle and nerve tissues

1. Chemical composition of muscle tissue.
2. Features of energy metabolism in muscle. biochemical mechanisms of muscle contraction.
3. Smooth muscle tissue.
4. Heart muscle. Myocardial infarction. Muscular dystrophies. Cardio-myopathies.
5. Chemical composition and metabolic properties of nerve tissue.
6. The structure of the nerve fiber. Biochemical mechanisms of generation and transmission of nerve impulses.
7. Cerebrospinal fluid. Biochemical mechanisms of sleep and memory.
8. Metabolic disorders of nerve tissue.
9. Determination and clinical significance of serum cholinesterase activity.
10. Determination and diagnostic value of the activity of the enzymes lactate dehydrogenase and creatine phosphokinase in blood serum.

LESSONS VI
Pathobiochemistry of water-salt metabolism

1. The role, amount and distribution of water in the body. The body's need for water. Ways of excretion of water from the body.
2. Disorders of water metabolism: hypohydration
3. Disorders of water metabolism: hyperhydration
4. Edemas - types, causes.
5. Disorders of mineral metabolism. Demand for mineral salts.
6. Disorders of sodium metabolism.
7. Disorders of potassium metabolism.
8. Microelements.
9. Determination and clinical significance of serum sodium.
10. Determination and clinical significance of potassium in blood serum.

LIST OF TOPICS IN FREE WORKS OF PATHOLOGICAL BIOCHEMISTRY

1. Hereditary disorders of carbohydrate metabolism (fructosuria, galactosemia, glycogenosis). Types of diet during these diseases.
2. Modern methods of diagnosis and treatment of diabetes. The course of diabetes in pregnant women and its effect on the body during intrauterine development. Features and causes of diabetes in children.
3. Acquired and hereditary disorders of lipid metabolism, diagnostics and treatment methods.
4. Acquired and inherited disorders of protein metabolism, diagnostics and treatment methods. Hereditary disorders of amino acid metabolism and related diets.
5. Hereditary disorders of purine and pyrimidine bases, types of diagnosis, treatment and diet.
6. The role of water in the body. Water metabolism disorders: hypo and hyperhydration, complications and treatment methods. Mechanisms of endocrine and non-endocrine regulation of water-salt metabolism.
7. The role of Na + and K + in the body. Hypo- and hypernatremia, hypo- and hyperkalemia, complications and treatment methods.
8. Features of the chemical composition of connective tissue. Fibrillar proteins of connective tissue.
9. Structure, functions of collagen, metabolic disorders. Proteoglycans: types, structure, functions, metabolic disorders. Collagenoses. Mucopolysaccharidoses.
10. Biochemical diagnosis of connective tissue damage. Determination of hydroxyproline in urine and its clinical significance. Determination and clinical significance of sialic acids,

seroglycoids, C-reactive protein, RF and ASO in the blood. Metabolic disorders observed in connective tissue during aging.

11. Chemical composition and metabolic properties of bone tissue. Endocrine regulation of metabolism in bone tissue. The role of vitamins in bone metabolism.
12. Pathology of bone tissue. Osteoporosis: mechanisms of development, research.
13. Features of the chemical composition of nerve tissue. Metabolic properties of nerve tissue.
14. Features of energy and carbohydrate metabolism in nerve tissue.
15. Features of lipid and protein metabolism in nerve tissue. Structure and functions of nerve fibers.
16. Mechanisms of formation and transmission of nerve impulses. Substances that affect the synaptic transmission of nerve impulses.
17. Mediators of the nervous system. Cholinergic and adrenergic synapses. The role of serotonin and GABAs in nerve tissue.
18. Neuropeptides. Biochemical mechanisms of sleep and memory.
19. Chemical composition and functions of cerebrospinal fluid. Methods of biochemical research of cerebrospinal fluid, clinical significance.
20. Metabolic disorders of nerve tissue.
21. Features of the chemical composition of muscle tissue. Muscle tissue proteins. Extracts of muscle tissue. Features of energy metabolism in muscle tissue.
22. Biochemical mechanisms of muscle contraction. Regulatory mechanisms of muscle contraction.
23. Metabolic features of skeleton, smooth and heart muscle.
24. Muscular dystrophies. Metabolic disorders observed in tissues during muscular dystrophies. Biochemical diagnosis of muscular dystrophies.
25. Mechanisms of development of myocardial infarction, risk factors. Metabolic disorders in tissues during myocardial infarction. Diagnosis of myocardial infarction.
26. Cardiomyopathies: types, causes, mechanisms of development. Metabolic disorders observed in tissues during cardiomyopathies.

PROCEDURES FOR CONDUCTING COLLOQUİUM

The purpose of the lesson: To determine the degree of mastery of the unit by students through an individual survey.

The teacher calls 4 students to answer. The date of the month, the student's last name, and the ticket number are indicated on the sheet.

The ticket contains 4 questions with 2.5 points each: 3 colloquium questions; There is one situational issue. If the question has a structure, scheme and if the student cannot write them, but gives an oral answer, the answer is evaluated with a maximum of 1 point. It is not necessary to write the text of the answer.

When students answer questions, it is important to pay attention to the extent to which they have mastered the important questions of the unit. The teacher is assigned to the next lesson according to the calendar-theme plan.

TOPICS OF PRESENTATION IN CLINICAL BIOCHEMISTRY

The teacher presents the presentation topics individually for each group.

REFERENCES

11. Islamzade F.I., Efendiyev AM, Islamzade F.Q. Fundamentals of human biochemistry (textbook, Volume I). Baku, 2015.
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13. Efendiyev AM, Islamzade FQ, Garayev AN, Eyyubova AA "Laboratory classes on biological

chemistry" (textbook). Baku, 2015.
14. Efendiyev AM, Eyyubova AA, Garayev AN "Pathological and clinical biochemistry" (textbook). Baku, 2019.