

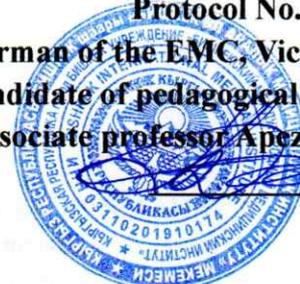


APPROVED
EMD decision

" 13 " 09 2021

Protocol No. 4

Chairman of the EMC, Vice-Rector,
candidate of pedagogical sciences,
associate professor Apezova D.U.



SILLABUS by discipline

B.3.1.1. GENERAL AND CLINICAL BIOCHEMISTRY

For students of the educational program of higher professional education in the specialty 560001 "General Medical" (5 years of education) in the specialty "Doctor"

Type of study work	Total hours
course	1
Semester	2,3
Number of weeks	31
<i>The total complexity of the discipline</i>	7
Classroom/practical studies (PS)	210
Lectures	126/84
Laboratory work	84
Student Independent Work (SIW)	
Forms of control	
current control	Testing, oral questioning, written test
Frontier control	Testing
Midterm	Testing
Final control	exam
Semester rating by discipline:	Point-rating system

Information about the teacher of the academic discipline

Full Name	Taalaibekova Meerim Taalaibekovna
Post	Teacher
Academic degree	-
Academic title	-
Email address	meka_0694@mail.ru
Location of the department (address)	KR, Bishkek, st. Shabdan Baatyr 128, floor 2
Telephone	0550909xxx
Consultation hours	11.00-13.30

Characteristics of the study discipline

The purpose of the discipline is to form a systematic knowledge of the basic patterns of molecular mechanisms of functioning of biological systems that determine the state of health and human adaptation at the molecular, cellular and organ level of the integral organism, the creation of a theoretical basis for further study of medical and biological and clinical disciplines.

Prerequisites of the discipline

- Latin
- Biology with elements of ecology

Post requisites of the discipline:

- Basic Pharmacology
- Propedtherapy
- Endocrinology
- Hematology
- Occupational medicine
- Hospital Therapy
- Outpatient pediatrics
- Basics of Clinical Examinations in Internal Medicine
- Basics of Clinical Examinations in Pediatrics

Learning outcomes of the discipline according to the RO GPP

The study of microbiology, virology, and immunology will contribute to the achievement of the RE GEP:

RE-2: Recognize the effects of physicochemical, biological, and immune properties of environmental factors (including therapeutic factors) on the development and course of disease and on the body as a whole.

GC-1 - able and willing to analyze socially significant problems and processes, to use methods of natural sciences, mathematical and humanities in various types of professional and social activities.

Content of the discipline

№№	Name of topics
1.	Introduction to Biochemistry. Molecular components of the cell. Biomolecules. Levels of structural organization and physical and chemical properties of proteins.
2.	Classification of proteins. Simple proteins and natural peptides. Complex proteins.
3.	Macromolecular protein complexes: nucleoproteins, lipoproteins, glycoproteins, glycolipids.
4.	Biochemical basis of structural and functional organization of biological membranes of subcellular structures, functions of biomembranes. Transmembrane transport of substances.
5.	Neuroendocrine regulation of cell functions
6.	Levels of structural organization and physicochemical properties of proteins. Laboratory work No. 1 Protein dialysis; No. 2 Protein precipitation by boiling; No. 3 Protein precipitation by heavy metal salts
7.	Levels of structural organization and physicochemical properties of proteins.
8.	Methods of separation and quantification of proteins and amino acids Laboratory work № 1 Determination of total protein in blood serum by refractometric method; № 2 Quantification of the concentration of total blood serum protein by biuretic reaction on a photocolimeter.
9.	Simple and complex proteins
10.	Simple and complex proteins Laboratory work № 1 Preparation of hemin crystals; № 2 Determination of hemoglobin concentration in blood.
11.	Complex proteins - supramolecular protein complexes Laboratory work Hydrolysis of yeast nucleoproteins.
12.	Macromolecular protein complexes - nucleoproteins, lipoproteins, glycoproteins.
13.	Biological membranes. Structural and functional organization of the cell.
14.	Biological membranes Mechanisms of active transport of substances through membranes. Ca ²⁺ -, Na ⁺ -, K ⁺ -dependent ATPases.
15.	Biological membranes. Mechanisms of transmission of external signals inside the cell
16.	Enzymes proteins catalysts. Structure, mechanism of action.
17.	Properties of enzymes. Kinetics of enzymatic reactions. Regulation of enzyme activity.
18.	Nomenclature and classification of vitamins. Water-soluble vitamins, peculiarities of mechanisms of action, participation in metabolic processes. (Lecture) Nomenclature and classification of enzymes. Isoenzymes. Enzymopathology. Enzymodiagnosics. Enzymotherapy.
19.	The biological role of fat-soluble vitamins. Features of the mechanisms of action, participation in metabolic processes (role of intracellular histahormones).

20.	Enzymes, structure, mechanism of action Laboratory work Enzymatic hydrolysis of starch by salivary amylase at room temperature
21.	Properties of enzymes. Kinetics of enzymatic reactions. Regulation of enzyme activity.
22.	Properties of enzymes. Kinetics of enzymatic reactions. Laboratory work No. 1 Influence of temperature on the activity of salivary amylase enzyme; No. 2 Influence of pH on the activity of salivary amylase enzyme; No. 3 Specificity of action of salivary amylase; No. 4 Effect of activators and inhibitors on salivary amylase activity.
23.	Nomenclature and classification of enzymes. Laboratory work Quantitative determination of amylase activity by Wolgelmuth.
24.	Classification and nomenclature of enzymes
25.	Water-soluble vitamins Laboratory work № 1 Qualitative reactions for vitamin B1; № 2 Qualitative reactions for vitamin B2; № 3 Fluorescence thiochrome and riboflavin (demonstration); № 4 Quantitative determination of vitamin C in plant foods
26.	Water-soluble vitamins and their derivatives are the most important coenzymes and prosthetic groups of enzymes. Their role in catalysis.
27.	The biological role of fat-soluble vitamins. Laboratory work № 1 Qualitative reactions to vitamins A, D, E, vicasol; № 2 Separation of carotenoids on a chromatographic column.
28.	Biological role of fat-soluble vitamins.
29.	Introduction to Metabolism. Energy resources of the body. Specific and common pathways of catabolism
30.	Tissue respiration is a terminal stage of biological oxidation. Regulation of tissue respiration..
31.	Carbohydrates. Digestion, absorption, transport into cells. Glycolytic pathway of carbohydrate oxidation. Regulation of carbohydrate metabolism.
32.	Specific and common pathways of catabolism Laboratory work Qualitative reactions to substrates of the Krebs cycle.
33.	Integrative function of the tricarboxylic acid cycle in cellular metabolism - catabolic and anabolic functions.
34.	Tissue respiration is the terminal stage of biological oxidation. Laboratory work Qualitative determination of blood catalysis
35.	Energy metabolism. Biological oxidation.
36.	Carbohydrates. Digestion, absorption, transport into cells. Glycolytic pathway of carbohydrate oxidation. Synthesis and mobilization of glycogen in cells of the body. Laboratory work Determination of glucose concentration in blood by glucose oxidase method..
37.	Key reactions and enzymes of gluconeogenesis, the Krebs cycle, and glycolysis
38.	Pentose-phosphate pathway of glucose conversion Stages of pentose-phosphate pathway of glucose-6-phosphate oxidation. Gluconeogenesis
39.	Regulation of carbohydrate metabolism and energy formation in the cells of the body. Disorders of carbohydrate metabolism.
40.	Disorders of carbohydrate metabolism
41.	Chemistry and metabolism of lipids. Lipid biosynthesis. Regulation of lipid metabolism.
42.	Intermediate lipid metabolism intracellular lipolysis. Beta oxidation of fatty acids. Metabolism of ketone bodies. Their biological role.
43.	Cholesterol. It's biological functions
44.	Chemistry and lipid metabolism Laboratory work № 1 Kinetics of lipase action. No. 2 Qualitative reactions to acetone and acetoacetic acid.
45.	Peroxide oxidation of unsaturated fatty acids. Formation of endoperoxides: prostaglandins, thromboxanes, prostacyclins, leukotrienes. Natural antioxidants.
46.	Intermediate metabolism of lipids Laboratory work № 1 Determination of the content of beta-lipoproteins in blood serum.
47.	Intermediate metabolism of lipids
48.	The dynamic state of proteins in the body. Biological value of food proteins. Digestion. Proteolytic enzymes.
49.	The main pathways of amino acid metabolism in the body. Metabolism of individual amino acids. Hereditary disorders of amino acid metabolism.
50.	Protein Nutrition. Digestion, absorption of products of hydrolysis of proteins. Laboratory work No. 1 Quantitative determination of acidity of gastric juice.

51.	Protein Nutrition. Digestion, absorption of products of hydrolysis of proteins.
52.	Intermediate metabolism of amino acids Laboratory work No. 1 Determination of blood serum aminotransferase and alanine aminotransferase activity.
53.	Metabolism of individual amino acids: a) metabolism of phenylalanine and tyrosine; b) metabolism of tryptophan; c) metabolism of serine and glycine. Formation of single-carbon groups. Role of THFCs; d) metabolism of methionine and cysteine; e) dicarboxylic amino acids and their amides. Hereditary disorders of amino acid metabolism.
54.	Biogenic amines. Their synthesis. Biological role.
55.	Exchange and functions of nucleotides. Nucleotide biosynthesis. Decomposition of nucleotides, products of decomposition. Disruption of nucleotide metabolism.
56.	Nucleic acid biosynthesis (replication and transcription). Protein biosynthesis. Regulation of protein synthesis and molecular mechanisms of variability.
57.	Nucleotide metabolism. Laboratory work No. 1 Determination of uric acid in urine
58.	Biological role of nucleotides in body cells
59.	Nucleic acid biosynthesis (replication and transcription). Components necessary for replication. Stages of replication. Mechanism of replication. Transcription - RNA biosynthesis. Components required for transcription. DNA-dependent RNA polymerase. Biogenesis of m-RNA. Splicing. Biogenesis of t-RNA and p-RNA. Biological significance of replication and transcription.
60.	Nucleic acid biosynthesis (replication and transcription).
61.	Protein biosynthesis. Components of protein synthesis system - ribosomes, m-RNA, t-RNA, amino acids, enzymes, protein factors. Genetic code. Posttranslational modification of protein. Regulation of protein biosynthesis.
62.	Protein biosynthesis. Regulation of protein synthesis and molecular mechanisms of variability..
63.	Liver biochemistry. Blood biochemistry.
64.	Liver Biochemistry. (Wed) Blood Biochemistry
65.	Water and mineral metabolism. Functional renal biochemistry
66.	Connective tissue biochemistry. Muscle biochemistry. Biochemistry of nervous tissue..
67.	Hormones. Hormonal regulation of metabolic processes. Regulation of carbohydrate, protein, lipid and mineral metabolism. Interrelation of metabolism in the body as a single process of metabolism of proteins, fats, carbohydrates, nucleic acids.
68.	Biochemistry of the liver. Laboratory work No. 1 Sulam-phosphate test No. 2 qualitative reaction on the presence of bilirubin in blood serum
69.	Blood biochemistry Laboratory work No. 1 Study of inorganic phosphates of blood serum
70.	Renal biochemistry. Laboratory work No. 1 Qualitative reaction on protein in urine; No. 2 Qualitative reaction on glucose in urine with Felling reagent; No. 3 Qualitative reaction on bile acids; No. 4 Qualitative reaction on blood pigments - benzidine test
71.	Functional kidney biochemistry
72.	Connective tissue biochemistry Laboratory work No. 1 Quantitative determination of free oxyproline in urine
73.	Connective tissue biochemistry
74.	Muscle biochemistry. Laboratory work No. 1 Quantitative determination of creatinine in urine. +Muscle Biochemistry.
75.	Biochemistry of nervous tissue. Biochemistry of nerve tissue.
76.	Hormonal regulation of metabolism, biochemical adaptation, reproduction, growth and development of the organism. Hormonal regulation of metabolism, growth and development
77.	Hormonal regulation of metabolic processes
78.	The relationship of metabolism in the body as a single process of metabolism of proteins, fats, carbohydrates, nucleic acids. Solution of situational tasks.

List of basic and additional literature

Basic Literature:

Karapatz M. Fundamentals of microbiology, virology, immunology. Moscow: Knorus, 2020.

Supplementary Literature:

1. Levinson W. Medical Microbiology and Immunology Author: Publisher: Laboratory of Knowledge Year: 2020.
2. Kochubinsky, V. V., Kanashkova, T. A., Chernoshey, D. A., Gavrilova, I. A. Microbiology, virology, immunology. BGMU, 2020.
3. V. B. Sboichakov, "Fundamentals of Microbiology, Virology, and Immunology." M. 2017.

Internet Resources:

[http//www.edu.ru](http://www.edu.ru)
[http//www.medicina.ru](http://www.medicina.ru)
[http//www.infectology.ru](http://www.infectology.ru)
[http //www.journals.uchicago.edu/JAD/home.html](http://www.journals.uchicago.edu/JAD/home.html)

Monitoring and evaluation of learning outcomes.

The content of the rating system for assessing student performance

The rating assessment of students' knowledge in each academic discipline, regardless of its total labor intensity, is determined on a 100 (one hundred) - point scale and includes current, boundary, intermediate and final control.

The distribution of rating scores between types of control is established in the following ratio (according to the table of the score-rating system of assessments):

Form of control				
current (CC)*	boundary control (BC)**	mid-term exams (MC)***	Final /exam (FE)	Discipline Rating (RD)
0-100 points	0-100 points	0-100 points	0-100 points	0-100 points, with the translation of points into a letter designation

Note:

* $TK(middle) = \frac{\sum_1^n \times point}{\sum_1^n}$, where n is the number of types of classroom and extracurricular work of students in the discipline;

** $PK(middle) = \frac{\sum_1^n credit \times point}{\sum_1^n credits}$, where n is the number of modules (credits) in the discipline;

*** $IK(middle) = \frac{\sum_1^n \times point}{\sum_1^n}$, where n is the number of intermediate controls (2 controls per semester: in the middle and at the end of the semester) by discipline;

****ИК – examination conducted at the end of the study of the discipline

;

*****РД = $\frac{TK_{кр} + PK_{кр} + IK_{кр} + ИК}{4}$, the final rating of the results of all types of control at the end of the discipline;

$GPA = \frac{\sum_1^n \times балл}{\sum_1^n}$ where, n is the number of disciplines in the semester (for the past period of study).

A student who has not passed the current, boundary and intermediate controls to the final control (exam) is not allowed.

The current control is carried out during the period of classroom and independent work of the student on time according to the schedule, at the end of the study of the discipline, the average score of the current control (CC) is calculated. *Forms of current control can be:*

- testing (written or computerized);
- performance of individual homework assignments, abstracts and essays;
- student's work in practical (seminar) classes;
- various types of colloquia (oral, written, combined, express, etc.);
- control of performance and verification of reporting on laboratory work;
- visiting lectures and practical (seminar, laboratory) classes;
- Incentive rating (up to 10 points).

Other forms of current monitoring of results are also possible, which are determined by the teachers of the department and recorded in the work program of the discipline.

The frontier control is carried out in order to determine the results of the student's development of one credit (module) as a whole. *Frontier control* should be carried out only in writing, at the end of the study of the discipline, the average score of boundary control (BC) is calculated. As forms of *frontier control* of the training module, you can use:

- testing (including computer testing);

- interview with written fixation of students' answers;
- test.

Other forms of intermediate control of results are also possible.

Intermediate control (mid-term exams) is carried out in order to check the completeness of knowledge and skills in the material in the middle and end of the semester (2 times per semester) of studying the discipline, by the end of the study of the discipline, the average score of intermediate control (PCsr) is calculated, *forms of intermediate control (mid-term exams) can be:*

- testing (including computer testing);
- interview with written fixation of students' answers;
- test.

Other forms of intermediate control of results are also possible.

The final control is carried out during the session, by conducting an exam, it can be carried out in the following forms:

- testing (including computer testing);
- written exam (ticketing system).

Correspondence of the point-rating system of assessments used by the institute and the assessments of the European system for the transfer of credit units, labor intensity (ECTS)

Grade						Criterion
System of letters	digital system	Traditional system	Points (%)	Scored points (max - 100)	Evaluation by discipline without an exam	
A	4	5	95-100	95-100	Credited/ passed	"Excellent" - deserves a student who has shown a deep, systematic and comprehensive knowledge of the educational material, who freely performs practical tasks, who has mastered the recommended basic and additional literature on the discipline
A-	3,67		90-94	90-94		"Excellent" - deserves a student who has shown a deep, systematic and comprehensive knowledge of the educational material, who freely performs practical tasks, who has mastered the recommended basic literature on the discipline, but is not familiar with additional literature
B+	3,33	4	85-89	70-89		"Good" - exhibited to a student who has shown a systematic and comprehensive knowledge of the educational material, able to independently replenish and update this knowledge in the course of training, performing practical tasks, familiar with the main literature on the discipline
B	3,0		80-84			"Good" is given to a student who has shown a systematic and comprehensive knowledge of the educational material, who is able to independently replenish this knowledge in the course of training, performing practical tasks, but not fully familiar with the main literature on the discipline
B-	2,67		75-79			"Good" - is given to a student who has shown the systematic nature of knowledge in the discipline, who is able to independently replenish this knowledge in the course of training, performing practical tasks, but not fully familiar with the main literature on the discipline
C+	2,33	3	70-74	50-69		"Satisfactory" - is given to a student who does not have a systematic nature of knowledge in the discipline, who is not capable of independently replenishing and updating knowledge in the course of further education, performing practical tasks with errors
C	2,0		65-69			"Satisfactory" - is given to a student who made mistakes in completing assignments, but who has the necessary knowledge to eliminate them under the guidance of a teacher
C-	1,67		60-64			"Satisfactory" - is set to a student who made errors in the performance of tasks, but who has the possible knowledge to eliminate them under the guidance of a teacher
D+	1,33		55-59			"Satisfactory" - is set to a student who made errors in the performance of tasks, who does not have the necessary knowledge to eliminate them
D-	1,0		50-54			Satisfactory" - is given to a student who has made significant errors in the performance of tasks, who does not have the necessary knowledge to eliminate them
FX	0,5	2	25-49	Less of 50	not credited/not passed	"Unsatisfactory" - is set to a student who has not completed the task, does not have the necessary knowledge to eliminate them
F	0		0-24			"Unsatisfactory" - is set to a student who has not completed the task, does not have the necessary knowledge to eliminate them, even under the guidance of a teacher

Academic achievement requirements:

Attendance by students of all classroom classes without delay is mandatory.

In case of absence, classes are worked out in the order established by the dean's office.

If there are three passes, the teacher has the right not to allow the student to attend classes until the issue is administratively resolved.

If the absence of classes is more than 20.0% of the total number of classes, the student automatically enters the summer semester.

Note to the student:

- ✓ regularly review lecture material;
- ✓ Do not be late and do not miss classes;
- ✓ work off missed classes if you have permission from the dean's office;
- ✓ Actively participate in the classroom (individually and in groups;)
- ✓ timely and fully complete homework assignments;
- ✓ submit all assignments within the time specified by the teacher;
- ✓ independently study the material in the library and at home;
- ✓ timely and accurately fulfill the tasks of the teacher, individual tasks for the IWS to achieve learning outcomes;
- ✓ to master the basic and additional literature necessary for the study of the discipline;
- ✓ performing tasks, the student should not copy or reproduce the work of other students, scientists, practitioners, plagiarism;
- ✓ develop their intellectual and oratory skills;

In case of non-compliance with the requirements of the Memo, the student will be penalized in the form of deducting points (one point for each violated item).

If the requirements of the Memo are fully met, the student is encouraged in the form of an additional 10 points to the final control in the discipline.

Academic Integrity, Conduct and Ethics Policy:

- turn off your cell phone during class;
- Be polite;
- respect other people's opinions;
- formulate objections in the correct form;
- do not shout or raise your voice in the audience;
- independently complete all semester assignments;
- Eliminate plagiarism from your practice;

Methodical instructions.

It is recommended to organize the time required to study the discipline as follows:

When preparing for a practical lesson, you must first read the abstract with the teacher's explanations.

When performing exercises, you must first understand what you want to do in the exercise, then proceed to its implementation.

Literature work. The theoretical material of the course becomes more understandable when books are studied in addition to the abstract. After studying the main topic, it is recommended to perform several exercises.

Preparation for boundary and intermediate controls. In preparation for the boundary and intermediate control, it is necessary to study the theory: the definitions of all concepts before understanding the material and independently do several exercises.

Independent work of students is organized on all studied topics of each section. Independent work is carried out in the form of:

- work in Internet sites;
- work with basic and additional literature;
- fulfillment of written assignments;
- preparation of reports, abstracts, tables and posters on