ЛД-16 ИН

Federal State Budgetary Educational Institution of Higher Education

«North-Ossetia State Medical Academy»

of the Ministry of Healthcare of the Russian Federation

APPROVED

Rector of FSBEI HE NOSMA

MOH Russia

_____O.V. Remizov

"31" august 2020

EDUCATIONAL TRAINING PROGRAM OF DISCIPLINE

"Biochemistry"

the main professional educational program of higher education - specialty program in the specialty 31.05.01 General Medicine, approved in August 31, 2020

Form of education Full-time

The period of development 6

Department of Biological Chemistry

Vladikavkaz, 2020

When developing an educational training program, the discipline is based on:

1. Federal State Educational Standard of Higher Education on specialty 31.05.01 General Medicine, approved by the Ministry of Education and Science of the Russian Federation on February 9, 2016 №95

2. Academic plan on specialty 31.05.01 General Medicine,
ЛД-16-01-16 ИН
ЛД-16-02-17 ИН
ЛД-16-03-18 ИН
ЛД-16-04-19 ИН
ЛД-16-05-20 ИН

approved by the Scientific Council of the Federal State Budgetary Educational Institution of Higher Education «North-Ossetia State Medical Academy» of the Ministry of Healthcare of the Russian Federation "31" august 2020, Protocol № 1.

The educational training program of the discipline was approved at a meeting of the department of Biological Chemistry from "27" august 2020, Protocol №. 1

The educational training program of the discipline was approved at a meeting of the central coordinating training and methodological council from "28" august 2020, Protocol №.1

The educational training program of the discipline was approved by the Scientific Council of the State Medical University of the Federal State Budgetary Educational Institution of Higher Education «North-Ossetia State Medical Academy» of the Ministry of Healthcare of the Russian Federation from "31" august 2020, Protocol № 1.

Developers:

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Contents of the work program

1. The name of the discipline;

2. List of planned learning outcomes for the discipline, correlated with the planned results of the educational program;

3. Indication of the place of the discipline in the structure of the educational program;

4. The amount of discipline in credit units, indicating the number of academic or astronomical hours allocated to the contact work of students with the teacher (by types of training sessions) and the independent work of students;

5. Content of the discipline, structured according to topics (sections) with indication of the number of academic or astronomical hours and types of study sessions allocated for them;

6. List of educational and methodological support for independent work of students on discipline;

7. A fund of evaluation tools for conducting intermediate certification of trainees in discipline;

8. List of basic and additional educational literature necessary for mastering the discipline;

9. List of resources of the information and telecommunications network "Internet" (hereinafter referred to as the "Internet" network), necessary for mastering the discipline;

10. Methodical instructions for students to develop discipline;

11. List of information technologies used in the implementation of the educational process for discipline, including a list of software and information reference systems (if necessary);

12. A description of the material and technical base necessary for the implementation of the educational process for discipline.

13. Conducting educational activities using e-learning and distance learning technologies.

2. The list of planned learning outcomes for the discipline and the results of mastering the educational program.

№	Competency number / index	Contents of the discipline (or its sections)	Results of development		
			know	be able to	own
1	2	3	4	5	6
1.	GPC-7	1. Proteinogenic amino acids: structure, properties, classification. 2. Chemistry of simple proteins, the structural organization of the protein molecule. 3. Physico-chemical properties of simple proteins. Methods of precipitation. 4. Physico-chemical properties of complex proteins. 5. Enzymes as biological catalysts: structure and properties. Determination of enzymatic activity in biological fluids. 6. Water-soluble vitamins: vitamin B1, B2, B6, PP, C. Coenzyme function. Participation in metabolism and energy 7. Regulation of enzyme activity. Medical aspects of enzymology 8. Fat-soluble vitamins A, D, E, F, K. Metabolism of vitamins D in the human body 9. Lipids of biomembranes, structure, functions. Methods of transmembrane transport of substances. Mechanisms of signal receipt into the cell 10. Metabolism and energy. The chain of transport of electrons, its structural organization. The mechanism of oxidative	To know the chemical-biological essence of the processes occurring in the living body of a person at the molecular and cellular levels.	Be able to apply the methods studied to solve professional problems.	Process laboratory-chemical methods for studying the processes occurring in the body

		phosphorylation 11. Peroxide oxidation. Its role in the norm and pathology. Active forms of oxygen 12. The common path of catabolism - the cycle of tricarboxylic acids. Determination of the activity of succinate dehydrogenase 13. Digestion of carbohydrates in the gastrointestinal tract 14. Anaerobic oxidation of glucose: glycolysis, glycogenolysis, alcohol fermentation 15. Aerobic: dichotomous and apotomic oxidation of glucose 16. Regulation of blood glucose level. Gluconeogenesis. Exchange of glycogen. Disturbance of carbohydrate metabolism 17. Digestion and absorption of lipids in the gastrointestinal tract. The role of bile acids in this process. Formation of transport forms of lipids. 18. Exchange of higher fatty acids and ketone bodies: oxidation and biosynthesis. Regulation. Determination of ketone bodies in the urine 19. Exchange of simple and complex lipids: TAG and phospholipids 20. Cholesterol exchange. Quantitative determination of cholesterol in blood serum. Transport forms of lipids. Lipid exchange pathology 21. Digestion and absorption of proteins. Determination of the activity of gastric juice enzymes. 22. Common ways of amino acid catabolism: transamination and decarboxylation. Clinical and diagnostic values. 23. Ways of accumulation and neutralization of ammonia in the			

		human body 24. Exchange of individual amino acids. Irreplaceable amino acids. 25. Exchange of nucleoproteins: purine and pyrimidine nucleotides. 26. Exchange of chromoproteins: biosynthesis and decomposition of hemoglobin in tissues. Porphyria. Biochemical diagnosis of jaundice. Exchange of iron 27. Introduction to endocrinology. Chemistry of peptide hormones. Secondary messengers. Carrying out a hormonal signal. 28. Chemistry of steroid hormones. 29. Biochemistry of blood and immunity. 30. Biochemistry of urine. Water-mineral exchange.			
2.	PC-21	1. Proteinogenic amino acids: structure, properties, classification. 2. Chemistry of simple proteins, the structural organization of the protein molecule. 3. Physico-chemical properties of simple proteins. Methods of precipitation. 4. Physico-chemical properties of complex proteins. 5. Enzymes as biological catalysts: structure and properties. Determination of enzymatic activity in biological fluids. 6. Water-soluble vitamins: vitamin B1, B2, B6, PP, C. Coenzyme function. Participation in metabolism and energy 7. Regulation of enzyme activity. Medical aspects of enzymology 8. Fat-soluble vitamins A, D, E, F, K. Metabolism of vitamins D in	To know the chemical-biological essence of the processes occurring in the living body of a person at the molecular and cellular levels.	Be able to apply the methods studied to solve professional problems	Process laboratory-chemical methods for studying the processes occurring in the body

		the human body 9. Lipids of biomembranes, structure, functions. Methods of transmembrane transport of substances. Mechanisms of signal receipt into the cell 10. Metabolism and energy. The chain of transport of electrons, its structural organization. The mechanism of oxidative phosphorylation 11. Peroxide oxidation. Its role in the norm and pathology. Active forms of oxygen 12. The common path of catabolism - the cycle of tricarboxylic acids. Determination of the activity of succinate dehydrogenase 13. Digestion of carbohydrates in the gastrointestinal tract 14. Anaerobic oxidation of glucose: glycolysis, glycogenolysis, alcohol fermentation 15. Aerobic: dichotomous and apotomic oxidation of glucose 16. Regulation of blood glucose level. Gluconeogenesis. Exchange of glycogen. Disturbance of carbohydrate metabolism 17. Digestion and absorption of lipids in the gastrointestinal tract. The role of bile acids in this process. Formation of transport forms of lipids. 18. Exchange of higher fatty acids and ketone bodies: oxidation and biosynthesis. Regulation. Determination of ketone bodies in the urine 19. Exchange of simple and complex lipids: TAG and phospholipids 20. Cholesterol exchange. Quantitative determination of cholesterol in blood serum. Transport forms of lipids. Lipid			

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3.	PC-22	1. Proteinogenic amino acids: structure, properties, classification. 2. Chemistry of simple proteins, the structural organization of the protein molecule. 3. Physico-chemical properties of simple proteins. Methods of precipitation. 4. Physico-chemical properties of complex proteins. 5. Enzymes as biological catalysts: structure and properties.	To know the chemical-biological essence of the processes occurring in the living body of a person at the	Be able to apply the methods studied to solve professional problems	Process laboratory-chemical methods for studying the processes occurring in

		Determination of enzymatic activity in biological fluids. 6. Water-soluble vitamins: vitamin B1, B2, B6, PP, C. Coenzyme function. Participation in metabolism and energy 7. Regulation of enzyme activity. Medical aspects of enzymology 8. Fat-soluble vitamins A, D, E, F, K. Metabolism of vitamins D in the human body 9. Lipids of biomembranes, structure, functions. Methods of transmembrane transport of substances. Mechanisms of signal receipt into the cell 10. Metabolism and energy. The chain of transport of electrons, its structural organization. The mechanism of oxidative phosphorylation 11. Peroxide oxidation. Its role in the norm and pathology. Active forms of oxygen 12. The common path of catabolism - the cycle of tricarboxylic acids. Determination of the activity of succinate dehydrogenase 13. Digestion of carbohydrates in the gastrointestinal tract 14. Anaerobic oxidation of glucose: glycolysis, glycogenolysis, alcohol fermentation 15. Aerobic: dichotomous and apotomic oxidation of glucose 16. Regulation of blood glucose level. Gluconeogenesis. Exchange of glycogen. Disturbance of carbohydrate metabolism 17. Digestion and absorption of lipids in the gastrointestinal tract. The role of bile acids in this process. Formation of transport forms of lipids. 18. Exchange of higher fatty acids	molecular and cellular levels.		the body

		and ketone bodies: oxidation and biosynthesis. Regulation. Determination of ketone bodies in the urine 19. Exchange of simple and complex lipids: TAG and phospholipids 20. Cholesterol exchange. Quantitative determination of cholesterol in blood serum. Transport forms of lipids. Lipid exchange pathology 21. Digestion and absorption of proteins. Determination of the activity of gastric juice enzymes. 22. Common ways of amino acid catabolism: transamination and decarboxylation. Clinical and diagnostic values. 23. Ways of accumulation and neutralization of ammonia in the human body 24. Exchange of individual amino acids. Irreplaceable amino acids. 25. Exchange of nucleoproteins: purine and pyrimidine nucleotides. 26. Exchange of chromoproteins: biosynthesis and decomposition of hemoglobin in tissues. Porphyria. Biochemical diagnosis of jaundice. Exchange of iron 27. Introduction to endocrinology. Chemistry of peptide hormones. Secondary messengers. Carrying out a hormonal signal. 28. Chemistry of steroid hormones. 29. Biochemistry of blood and immunity. 30. Biochemistry of urine. Water-mineral exchange.			

3. The place of discipline in the structure of the educational program

3.1.1.Discipline - Biological chemistry, refers to the cycle of the base part of the Block 1 of Federal State Educational Standard of Higher Education on specialty 31.05.01 general medicine, the knowledge of which is necessary for every physician. In the general system of doctor training, biological chemistry occupies a special position - it is a science that, on the one hand, provides fundamental general biological knowledge, and on the other hand it is applied medical.

4. Scope of discipline.

№	Type of work		Total credit units	Total hours	Semesters	
					III	IV
					Hours	Hours
1	2		3	4	5	6
1	**Contact work of students with teacher (total), including:**		4	144	60	84
2	Lectures (L)			40	20	20
3	Clinical practical exercises (PE)					
4	Seminars (S)					
5	Laboratory work (LW)		3	104	40	64
6	**Independent studen twork (ISW)**		2	72	30	42
7	**Type of intermediate attestation**	Set-off (S)				
		Exam (E)	1	36	-	36
8	**TOTAL: Total labor intensity**	**Hours**	252	252	90	162
		Accounting unit of labor intensity	7	7	2,5	4,5

5. The content of the discipline.

№	№ semester	The name of the section	The types of academic work, including independent work of students (in hours)					Forms of current control of progress
			Lectures	LW	PW	SIW	Total	
1	3	Chemistry of simple and complex proteins	4	10	-	4	18	test control with the elements of visual identification, interview, situational tasks, written survey, module
2	3	Enzymes medical aspects of enzymology	4	6	-	4	14	test control with the elements of visual identification, interview, situational tasks, written survey, module
3	3	Vitamins and coenzymes	-	4	-	4	8	test, interview, situational tasks, written survey, examination
4	3	The basics of biosynthesis of nucleic acids and proteins	-	-	-	8	8	test control with the elements of visual identification, a written survey, module
5	3	Lipids , structure, properties, classification. The structure and function of biological membranes.	2	2	-	4	8	The solution of situational tasks; test control with elements of visual identification, interview, situational tasks, written survey, module
6	3	Energy metabolism and the General ways	4	8	-	2	14	The solution of situational tasks; test control with elements

		of catabolism						of visual identification, interview, situational tasks, written survey, module
7	3	The metabolism of carbohydrates.	6	10	-	4	20	the decision of situational problems, test control, module
8	4	Lipid metabolism.	6	14	-	4	24	The solution of situational tasks; test control with elements of visual identification, interview, situational tasks, written survey, module
9	4	Exchange of amino acids.	6	12	-	4	22	test control with the elements of visual identification, interview, situational tasks, written survey, examination
10	4	The exchange of nucleotides	2	2	-	2	6	The solution of situational tasks; test, written survey, examination
11	4	Metabolism of heme and iron metabolism.	2	6	-	4	12	The solution of situational tasks; test control with elements of visual identification, interview, situational tasks, written survey, module
12	4	Hormonal regulation of metabolism and body functions	4	10	-	4	18	The solution of situational tasks; test control with elements of visual identification,

								interview, situational tasks, written survey, examination, module
13	4	Blood biochemistryand immunity.	-	6	-	2	8	the practical solution of situational tasks, the interview, situational tasks, written survey, examination, Module
14	4	Biochemistry of organs and tissues.	-	2	-	4	6	the practical solution of situational tasks, the interview, situational tasks, written survey, examination
15	4	Water and mineral metabolism. The regulation of water-salt metabolism.	-	8	-	2	10	the practical solution of situational tasks, the interview, situational tasks, written survey, examination
16	4	Introduction to clinical biochemistry.	-	2	-	2	4	the practical solution of situational tasks, the interview, situational tasks, written survey, examination
17	4	The final class		2		14	16	Final testing
		Exam					36	
		TOTAL:	**40**	**104**		**72**	**252**	

6. The list of training and methodological support for independent work of students on discipline

№	№ of semester	The name of the educational-methodical development
1	3,4	Guide to laboratory classes in biological chemistry, speciality 31.05.01 general medicine (part 1,2)

2	3,4	Guide to laboratory classes in biological chemistry, speciality 31.05.01 general medicine (part 3,4)

7. Fund of assessment tools for intermediate evaluation of students in the discipline

№	The list of competencies	№ of semester	Indicator(s) evaluation	Criterion(s) of assessment	Scale of evaluation	Name of FAT
1	**2**	**3**	**4**	**5**	**6**	**7**
1	GPC-7, PC-21, PC-22	3-4	see standard for evaluating the quality of education, approved by order of the FSBEI HE NOSMA of the Ministry of Healthcare of the Russian Federation on 10.07.2018, No.264/o	see standard for evaluating the quality of education, approved by order of the FSBEI HE NOSMA of the Ministry of Healthcare of the Russian Federation on 10.07.2018, No.264/o	see standard for evaluating the quality of education, approved by order of the FSBEI HE NOSMA of the Ministry of Healthcare of the Russian Federation on 10.07.2018, No.264/o	Examination fees to offset; The test task; Control tasks

8. The main list of textbooks required for the development of the discipline

п/№	Name	Author (s)	Year, place of publication	The number of instances	
				in library	on the Department
1	2	3	4	5	6
Main literature					
1	Essentials of Medical Biochemistry With Clinical Cases Second edition	N.V. Bhagavan Chung-Eun Ha	Academic Press 2015	43	0
2	Clinical biochemistry: metabolic and clinical aspects Third edition	W.Marshall	Churchill livingtone Elsevier 2014	8	0
3	Medical biochemistry fourth edition	J.Baynes M. Dominiczak	Saunders Elsevier 2014	8	0
Additional literature					
1	Elseviers integrated review	Pelley J.	Elsevier saunders 2012	3	0

	biochemistry Second edition				
2	Rapid review biochemistry Third edition	Pelley J. E. Goljan	Mosby Elsevier 2011	3	0
3	Biochemistry Third edition	L. Davidson	Philadelphia: Harwal Publishing 1994	1	0

СОГЛАСОВАНО
Зав. библиотекой

9. List of resources information and telecommunications network "Internet" necessary for the development of the discipline

1. Resources e-library SOGMA;
2. www.chemnet.ru,
3. www.chem.msu.su/rus/elibrary,
4. www.chemistry.narod.ru,
5. www.biblioclub.ru,
6. www.booksmed.com,
7. www.bio-x.ru/books-related

10. Methodical instructions for students for the development of the discipline

Training consists of classroom instruction (144 hours) including lectures and laboratory practical classes and independent work (72 hours). The main training time is allocated for laboratory and practical work on the development of biological chemistry.

The study of biological chemistry as a discipline it is necessary to use knowledge of biology, chemistry and physics and to develop practical skills that are generated during the laboratory workshop on biological chemistry.

Practical classes are conducted in the form of laboratory works, demonstrations of biochemical experiments and the use of visual AIDS, decision of situational tasks.

In accordance with the requirements of the FSES IN the educational process is widely used active and interactive forms of conducting classes (video, situation tasks, independent work of students). The proportion of lessons in interactive forms is not less than 30% of the classroom lessons.

11. The range of information technologies used in the implementation of the educational process in the discipline

Seme ster	Type of work PW,LW,SIW	Used educational technology (active, interactive)	The number of hours	% of classes in an interactive form	List of software
3,4	LW	A set of slides, movies to traditional lectures	40		Microsoft Office PowerPoint Internet Exploer
3,4	PW	A set of questions and tasks for practical tasks, a set of situational tasks for AP, the set of histories for the	104	30	Microsoft Office

		analysis of clinical cases.			
3,4	SIW	Questions and tasks for independent work	72		Microsoft Office Internet Exploer

12. Description of material-technical base necessary for realization of the educational process in the discipline.

№	Name of the equipment	number	Technical condition
1	2	3	4
	Special equipment		
1.	Laboratory analytical scales	1	In working condition
2.	Water bath	4	In working condition
3.	GP-160 air sterilizer	1	In working condition
4.	GP-80 air sterilizer	1	In working condition
5.	Dispensers	3	good, need increased amount
6.	Interactive whiteboard	1	In working condition
7.	Sound-amplifying equipment (speakers)	2	In working condition
8.	Sets of slides and tables	1	Need replacement
9.	Biological microscopes	2	In working condition
10.	Multimedia installation	1	In working condition
11.	Multimedia projector	1	In working condition
12.	Mobile screen	1	In working condition
13.	PH meter FE 20-KIT with additional electrode	1	In working condition
14.	Automatic air sterilizer GP-160	1	In working condition

15.	Thematic set of illustrations for sections of the discipline	1	Requires updating
16.	Laser pointer	2	In working condition
17.	Photoelectrocolorimeter KFK-3km	2	In working condition
18.	Fridge	1	In working condition
19.	SM-6m centrifuge	5	In working condition
20.	Exhaust Cabinet LC-1500SHV	3	In working condition
21.	Exhaust Cabinet LC-1800SHV	1	In working condition
22.	Test tubestands	10	In working condition
23.	Electronic scale	1	In working condition

13. Conducting educational activities using e-learning and distance learning technologies.

In the conditions of introduction of restrictive measures (quarantine) associated with an unfavorable epidemiological situation, the threat of the spread of a new coronavirus infection, and other force majeure events that do not allow conducting training sessions in person, it is possible to study this discipline or part of it using e-learning and distance education technologies.

Teaching the discipline in the above situations will be carried out through the development of an electronic course with access to video lectures and interactive course materials: presentations, articles, additional materials, tests and various tasks. When conducting training sessions, current monitoring of academic performance, as well as intermediate certification of students, the academy's electronic information and educational environment platforms and/or other e-learning systems recommended for use in the academy, such as Moodle, Zoom, Webinar, etc. can be used.

Lectures can be presented in the form of audio, video files, "live lectures", etc.

Seminars and practical classes can be held on-line in both synchronous and asynchronous modes. Seminars can be held in the form of web conferences.