

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION

**Federal State Autonomous Educational Institution of Higher Education  
«National Research Lobachevsky State University of Nizhny Novgorod»**

Институт клинической медицины

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УТВЕРЖДЕНО

решением Ученого совета ННГУ

протокол № 10 от 02.12.2024 г.

**Working programme of the discipline**

Bioorganic chemistry, chemistry of dental materials

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Higher education level

Specialist degree

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Area of study / speciality

31.05.03 - Dentistry

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Focus /specialization of the study programme

Dentistry

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Mode of study

full-time

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Nizhny Novgorod

Year of commencement of studies 2025

## 1. Место дисциплины в структуре ОПОП

Дисциплина Б1.О.17 Биоорганическая химия, химия стоматологических материалов относится к обязательной части образовательной программы.

## 2. Планируемые результаты обучения по дисциплине, соотнесенные с планируемыми результатами освоения образовательной программы (компетенциями и индикаторами достижения компетенций)

Формируемые компетенции (код, содержание компетенции)	Планируемые результаты обучения по дисциплине (модулю), в соответствии с индикатором достижения компетенции		Наименование оценочного средства	
	Индикатор достижения компетенции (код, содержание индикатора)	Результаты обучения по дисциплине	Для текущего контроля успеваемости	Для промежуточной аттестации
ОПК-8: Способен использовать основные физико-химические, математические и естественнонаучные понятия и методы при решении профессиональных задач	ОПК-8.1: Знать основные физико-химические, математические и естественнонаучные понятия и методы ОПК-8.2: Уметь использовать основные физико-химические, математические и естественнонаучные понятия и методы при решении профессиональных задач ОПК-8.3: Владеть опытом использования основных физико-химических, математических и естественнонаучных понятий и методов при решении профессиональных задач	ОПК-8.1: Знает основные физико-химические, математические и естественнонаучные понятия и методы  ОПК-8.2: Умеет использовать основные физико-химические, математические и естественнонаучные понятия и методы при решении профессиональных задач  ОПК-8.3: Владеет опытом использования основных физико-химических, математических и естественнонаучных понятий и методов при решении профессиональных задач	Отчет по лабораторным работам Коллоквиум	Экзамен: Задания

## 3. Структура и содержание дисциплины

### 3.1 Трудоемкость дисциплины

	<b>очная</b>
<b>Общая трудоемкость, з.е.</b>	<b>4</b>
<b>Часов по учебному плану</b>	<b>144</b>
в том числе	
<b>аудиторные занятия (контактная работа):</b>	
- занятия лекционного типа	32

- занятия семинарского типа (практические занятия / лабораторные работы)	64
- КСР	2
самостоятельная работа	10
Промежуточная аттестация	36 Экзамен

### 3.2. Содержание дисциплины

(структурированное по темам (разделам) с указанием отведенного на них количества академических часов и виды учебных занятий)

Наименование разделов и тем дисциплины	Всего (часы)	в том числе			
		Контактная работа (работа во взаимодействии с преподавателем), часы из них			Самостоятельная работа обучающегося, часы
		Занятия лекционного типа	Занятия семинарского типа (практические занятия/лабораторные работы), часы	Всего	
	о ф о	о ф о	о ф о	о ф о	о ф о
Introduction to Organic and bioorganic Chemistry	49	16	28	44	5
General characteristics of chemical compounds used in dentistry and materials based on them	57	16	36	52	5
Аттестация	36				
КСР	2			2	
Итого	144	32	64	98	10

### Contents of sections and topics of the discipline

1. The section "Introduction to organic and bioorganic chemistry" includes:

Introduction to organic and bioorganic chemistry. General ideas about the structure of organic and bioorganic molecules and methods of their research. The main regularities of the reactivity of organic compounds as the chemical basis of their biological functioning. Biologically active low molecular weight organic compounds. Structure and reactivity, biomedical significance and application. Poly- and heterofunctional organic and bioorganic compounds. Their role in the process of vital activity of living organisms and the synthesis of drugs. Biologically important heterocyclic compounds and their role in biochemical processes. Natural and synthetic polymers as biologically active high molecular weight compounds.

2. The section "General characteristics of chemical compounds used in dentistry and materials based on them" includes:

General characteristics of chemical compounds used in dentistry and materials based on them. Natural and synthetic inorganic compounds as the basis for the creation of dental materials. Medical polymers: synthesis,

properties and application in dentistry. Modern composite materials and their application in dentistry. Dental ceramics.

#### **4. Учебно-методическое обеспечение самостоятельной работы обучающихся**

Самостоятельная работа обучающихся включает в себя подготовку к контрольным вопросам и заданиям для текущего контроля и промежуточной аттестации по итогам освоения дисциплины приведенным в п. 5.

Органическая химия. Краткий курс: Учебное пособие/Иванов В. Г., Гева О. Н. - М.: КУРС, НИЦ ИНФРА-М, 2015. - 222 с. Режим доступа:

<http://znanium.com/bookread2.php?book=459210>. Органическая химия. Части III-IV: Учебное пособие / Горленко В.А., Кузнецова Л.В., Яныкина Е.А. - М.:МПГУ, 2012. - 414 с. Режим доступа: <http://znanium.com/bookread2.php?book=757103>.

#### **5. Assessment tools for ongoing monitoring of learning progress and interim certification in the discipline (module)**

##### **5.1 Model assignments required for assessment of learning outcomes during the ongoing monitoring of learning progress with the criteria for their assessment:**

##### **5.1.1 Model assignments (assessment tool - Report on laboratory works) to assess the development of the competency ОПК-8:**

1 lesson. Introductory lesson. Introduction to bioorganic chemistry, safety techniques.

Seminar: Classification of organic and bioorganic compounds, nomenclature.

2 Employment. Laboratory work "Qualitative chemical analysis of organic and bioorganic compounds for the content of carbon, hydrogen, nitrogen and halogens".

Seminar: Electronic structure of the carbon atom, hybridization. Types of bonds in organic compounds. Electronic effects in organic molecules. Intermediate reaction particles.

3. 3The employment. Laboratory work "Preparation and properties of alkanes, alkenes, alkynes and qualitative reactions to hydrocarbons".

Seminar: Chemical properties of alkanes, alkenes, alkynes. The mechanism of reactions of free radical substitution and electrophilic addition.

4. 4The employment. Laboratory work "Chemical properties of aromatic hydrocarbons and their derivatives".

Seminar: Electrophilic substitution reactions in aromatic hydrocarbons.

5. The lesson. Colloquium: Introduction to bioorganic chemistry, hydrocarbons (see the program).

6. The lesson. Laboratory work "Qualitative reactions involving hydroxyl-containing compounds (alcohols and phenols)".

Seminar: Nomenclature, structure and chemical properties of alcohols and phenols as hydroxyl-containing compounds. The biomedical significance of compounds with a hydroxyl group.

7. The lesson. Laboratory work "Chemical properties of compounds containing a carbonyl group in their composition (aldehydes and ketones)".

Seminar: The structure of the carbonyl group. Isomerism and nomenclature of aldehydes and ketones. Addition reactions by the carboxyl group. The biomedical significance of formaldehyde, urotropin, chloral hydrate and other hydroxyl-containing compounds.

8. The lesson. Laboratory work "Chemical properties of carboxylic acids and their derivatives".

Seminar: The structure of the carboxyl group. Isomerism, nomenclature.

carboxylic acids and their derivatives. Chemical properties of carboxylic acids. The biological significance of carboxylic acids and their derivatives.

9. The lesson. The seminar. Oxyacids, structure and properties. The concept of an asymmetric carbon atom. Optical isomerism on the example of oxy acids. The spatial structure of bioorganic compounds and their physiological activity.

10. The lesson. Colloquium. Hydroxyl-containing derivatives of hydrocarbons, carbonyl compounds, carboxylic acids and their derivatives (see the program).

11. The lesson. Laboratory work "Qualitative reactions to carbohydrates".

Seminar: Classification of carbohydrates, structure, stereoisomerism, chemical properties. Monosaccharides and their derivatives in biological processes.

Polysaccharides".

12. The lesson. Laboratory work "Qualitative reactions to amines, amino acids and proteins".

Seminar: Amines – basicity, nomenclature, chemical properties. Amino acids: nomenclature, isomerism, chemical properties. The biological significance of amines and amino acids.

13. The lesson. Laboratory work "Qualitative reactions to some heterocyclic compounds (using vitamins as an example)".

Seminar: Heterocyclic compounds. Structural features and chemical properties.

14. The lesson. Colloquium: Carbohydrates, amines, amino acids, proteins, heterocyclic compounds (see the program).

15. The lesson. Seminar: Chemical fundamentals of modern dental materials science.

16. The lesson. Control work on the chemistry of dental materials. Credit lesson on the course of bioorganic chemistry and chemistry of dental materials

**Assessment criteria (assessment tool — Report on laboratory works)**

Grade	Assessment criteria
pass	The level of knowledge in the volume corresponding to the training program. Several gross mistakes were made.
fail	The level of knowledge is below the minimum requirements. There were gross mistakes.

**5.1.2 Model assignments (assessment tool - Colloquium) to assess the development of the competency OIK-8:**

1. The subject of bioorganic chemistry.
2. Valence states of carbon atoms. Hybridization. Types of bonds in organic compounds.
3. Isomerism in organic compounds.
4. Electronic effects in organic compounds.
5. Intermediate reaction particles: free radicals, carbocations, carbanions. Electronic and spatial structure.
6. Reactions of free radical substitution on the example of alkanes
7. The oxidation reaction of alkanes with oxygen as the basis for the peroxide oxidation of lipid-containing systems
8. Antioxidants and their biomedical significance
9. Electrophilic addition reactions on the example of alkenes: halogenation, hydrohalogenation and hydration.
10. The concept of aromaticity in organic chemistry.
11. Aromatic hydrocarbons: the mechanism of electrophilic substitution reaction. The effect of substituents on the direction of the reaction.
12. The concept of hydrophilic and lipophilic properties of bioorganic molecules on the example of hydroxyl-containing organic compounds.
13. Monatomic alcohols and their chemical properties. Qualitative reactions to alcohols.
14. Nucleophilic substitution reactions on the example of alcohols.
15. Simple esters. Structure, isomerism and chemical properties. Application in medicine.
16. Phenols: structure and electronic effects in its molecule. Comparison of the reactivity of phenols and alcohols.
17. Chemical properties of phenol by hydroxyl group and aromatic ring.

18. The use of phenol and its derivatives. Phenolic compounds in nature.
19. The medical and biological significance of compounds with a hydroxyl group and their application.
20. The structure of the carbonyl group and the general characteristics of the reactivity of aldehydes and ketones.
21. Nucleophilic addition reactions involving a carbonyl group: interaction with water, alcohols, nitrogen-containing and other compounds.
22. The reaction of the formation of imines and their hydrolysis as the chemical basis of pyridoxal catalysis.
23. Condensation reactions involving aldehydes and ketones.
24. The presence of a CH-acid center in molecules containing a carbonyl group as the cause of the formation of a carbon-carbon bond in vivo.
25. Aldol addition and aldol cleavage, the biological significance of these processes.
26. Quinones and their participation in redox processes occurring in vivo.
27. Qualitative reactions to compounds containing a carbonyl group. The biomedical significance of formaldehyde, urotropin, chloral hydrate and other carbonyl compounds.
28. The structure of the carboxyl group. Chemical properties of carboxylic acids.
29. Functional derivatives of carboxylic acids.
30. Acylphosphates and acyl enzyme A as natural macroergic acylating agents. The biological role of acylation reactions.
31. Reactions by the type of aldol addition involving coenzyme A as a pathway for the formation of a carbon-carbon bond.
32. Ethylene glycol and glycerin as representatives of polyatomic alcohols. Chelated complexes of metals with their participation.
33. Amino alcohols: aminoethanol (colamine), choline, acetylcholine.
34. Aminophenols: dopamine, norepinephrine and adrenaline. The medical and biological significance of these compounds.
35. Stereoisomerism and reactivity of hydroxycarboxylic acids.
36. Lactic, malic, tartaric and citric acids as representatives of hydroxy acids.
37. Oxoacids: structure, chemical properties and biomedical significance.
38. Amino acids and their derivatives: stereoisomerism, formation of lactams.

39. The idea of beta-lactam antibiotics.

40. Heterofunctional derivatives of a number of benzene and their use in pharmacology (salicylic, aminobenzoic, sulfanylic acids and their derivatives).

41. Connections with mixed functions. Oxyacids. Isomerism. Methods of obtaining. Chemical properties of hydroxyl and carboxyl groups. Individual representatives: glycolic acid, lactic acid, malic acid, tartaric acids. Optical isomerism. The concept of an asymmetric carbon atom. Enantiomers, diastereoisomers and mesoform. Fischer's projection formulas. Methods of separation of racemates.

42. Pyruvic acid as a representative of ketoacids: preparation and properties, biological significance.

43. Carbohydrates. Classification. The structure and properties of monosaccharides, polyoxaldehydes on the example of glucose. Tautomeric forms: pyranose and furanose cycles,  $\alpha$ - and  $\beta$ -anomers. The conformation of glucopyranose. The phenomenon of mutarotation. Glucoside hydroxyl. Glycosides and their preparation.

44. Glucose stereoisomerism, D- and L-series. Chemical properties.

45. Lengthening and shortening of the sugar chain. Principles of establishing the structure of monosis.

46. Disaccharides: principles of disaccharide structure, reducing and non-reducing disaccharides. Individual representatives: sucrose, maltose, lactose. Structure, properties, being in nature.

47. Polysaccharides. Starch. Its constituent parts are amylose and amylopectin. Features. Application. Cellulose: structure, preparation, properties.

48. Heteropolysaccharides: hyaluronic acid, chondroitin sulfates. Heparin. The concept of mixed biopolymers. The effect of mucopolysaccharides on the stabilization of the collagen structure of dentin and enamel.

49. Nucleonic acids. Nucleoside monophosphates and nucleoside polyphosphates. Their role as macroergic compounds and intracellular bioregulators

50. Amino acids. Structure, methods of production, isomerism, nomenclature. Amino acids are like bipolar ions. The isoelectric point. Chemical properties of amino and carboxyl groups. The relation to heating, the formation of chelated compounds in interaction with metal salts.

51. Peptides, the peptide bond. Synthesis of peptides and cleavage of proteins. The concept of the composition, structure and structure of proteins.

52. Chemical properties of proteins: denaturation, biuretic reaction, xanthoprotein reaction, cysteine reaction, precipitation of proteins.

53. Fats as representatives of lipids: structure, chemical properties: hydrolysis, reduction, curing of fats.

54. Five-membered heterocycles: furan, pyrrole and thiophene, as representatives of aromatic heterocycles.. Building. Electrophilic substitution reactions: halogenation, nitration, sulfonation, acylation, mercurization.

55. The pyrrole cycle in natural compounds. Porphin. Porphyrins. Hemoglobin, chlorophyll. Indole. Indole derivatives: tryptophan, serotonin, indolylacetic acid. Indigo.



56. Six-membered heterocyclic compounds. Pyridine. Building. Methods of obtaining. Chemical properties. Properties of pyridine as a base. Electrophilic substitution reaction. Quinoline.

57. Alkaloids. General classification. Alkaloids of the pyridine and piperidine groups. Horse meat. Nicotine. Alkaloids of the quinoline group: quinine. Alkaloids of the tropane group. Atropine. Cocaine. Alkaloids of the morphine group. Morphine. Codeine. Alkaloids of purine groups. Purine. Caffeine.

58. The main classes of dental materials.

59. General characteristics of compounds used in dentistry and the requirements for them.

60. Dental cements used for filling root canals.

61. The concept of adhesives and adhesive systems and their application in dentistry.

62. Materials for oral hygiene and cleansing: chemical composition and properties, requirements for them.

63. General characteristics of synthetic polymers for medical purposes and their applications.

64. Basic methods of polymer synthesis.

65. Radical thermal and photochemical polymerization and its application in dentistry.

66. Polymers based on acrylic and methacrylic monomers as the basis for the creation of high-tech dental materials.

67. Classification of polymeric materials for removable dentures and methods of their preparation. Physico-chemical properties and characteristics of these materials.

68. Elastic materials for dentistry: synthesis methods and properties.

69. Composite materials and their application in dentistry.

70. Ceramic materials for dentistry: main characteristics and properties.

71. Materials for the manufacture of all-ceramic dentures.

### **Assessment criteria (assessment tool — Colloquium)**

Grade	Assessment criteria
pass	The level of knowledge in the volume corresponding to the training program. Several gross mistakes were made.
fail	The level of knowledge is below the minimum requirements. There were gross mistakes.

### **5.2. Description of scales for assessing learning outcomes in the discipline during interim certification**

## Шкала оценивания сформированности компетенций

Уровень сформированности компетенций (индикатора достижения компетенций)	плохо	неудовлетворительно	удовлетворительно	хорошо	очень хорошо	отлично	превосходно
	не зачтено		зачтено				
<u>Знания</u>	Отсутствие знаний теоретического материала. Невозможность оценить полноту знаний вследствие отказа обучающегося от ответа	Уровень знаний ниже минимальных требований. Имели место грубые ошибки	Минимально допустимый уровень знаний. Допущено много негрубых ошибок	Уровень знаний в объеме, соответствующем программе подготовки. Допущено несколько негрубых ошибок	Уровень знаний в объеме, соответствующем программе подготовки. Допущено несколько несущественных ошибок	Уровень знаний в объеме, соответствующем программе подготовки. Ошибок нет.	Уровень знаний в объеме, превышающем программу подготовки.
<u>Умения</u>	Отсутствие минимальных умений. Невозможность оценить наличие умений вследствие отказа обучающегося от ответа	При решении стандартных задач не продемонстрированы основные умения. Имели место грубые ошибки	Продemonстрированы основные умения. Решены типовые задачи с негрубыми ошибками. Выполнены все задания, но не в полном объеме	Продemonстрированы все основные умения. Решены все основные задачи с негрубыми ошибками. Выполнены все задания в полном объеме, но некоторые с недочетами	Продemonстрированы все основные умения. Решены все основные задачи. Выполнены все задания в полном объеме, но некоторые с недочетами	Продemonстрированы все основные умения. Решены все основные задачи с отдельными несущественными недочетами, выполнены все задания в полном объеме	Продemonстрированы все основные умения. Решены все основные задачи. Выполнены все задания, в полном объеме без недочетов
<u>Навыки</u>	Отсутствие базовых навыков. Невозможность оценить наличие навыков вследствие отказа обучающегося от ответа	При решении стандартных задач не продемонстрированы базовые навыки. Имели место грубые ошибки	Имеется минимальный набор навыков для решения стандартных задач с некоторыми недочетами	Продemonстрированы базовые навыки при решении стандартных задач с некоторыми недочетами	Продemonстрированы базовые навыки при решении стандартных задач без ошибок и недочетов	Продemonстрированы навыки при решении нестандартных задач без ошибок и недочетов	Продemonстрирован творческий подход к решению нестандартных задач

## Scale of assessment for interim certification

Grade		Assessment criteria
pass	outstanding	All the competencies (parts of competencies) to be developed within the discipline have been developed at a level no lower than "outstanding", the knowledge and skills for the relevant competencies have been demonstrated at a level higher than the one set out in the programme.

	<b>excellent</b>	All the competencies (parts of competencies) to be developed within the discipline have been developed at a level no lower than "excellent",
	<b>very good</b>	All the competencies (parts of competencies) to be developed within the discipline have been developed at a level no lower than "very good",
	<b>good</b>	All the competencies (parts of competencies) to be developed within the discipline have been developed at a level no lower than "good",
	<b>satisfactory</b>	All the competencies (parts of competencies) to be developed within the discipline have been developed at a level no lower than "satisfactory", with at least one competency developed at the "satisfactory" level.
	<b>unsatisfactory</b>	At least one competency has been developed at the "unsatisfactory" level.
<b>fail</b>	<b>poor</b>	At least one competency has been developed at the "poor" level.

### 5.3 Model control assignments or other materials required to assess learning outcomes during the interim certification with the criteria for their assessment:

#### 5.3.1 Model assignments (assessment tool - Assignments) to assess the development of the competency ОПК-8

Write the reaction equations indicating the intermediate stages and reaction particles, name the initial and final reaction products:

1. Alkane (the formula is given) + Cl<sub>2</sub> (under irradiation) or HNO<sub>3</sub> (under heating)

→ ?

2. Alkene (the formula is given) + Br<sub>2</sub> or HBr (or HCl) or H<sub>2</sub>O (in an acidic medium)

→ ?

3. Aromatic hydrocarbon or a derivative of aromatic hydrocarbon (the formula is given) + HNO<sub>3</sub>/H<sub>2</sub>SO<sub>4</sub> (end, t) or H<sub>2</sub>SO<sub>4</sub> (end, t) or Cl<sub>2</sub> (in the presence of AlCl<sub>3</sub> or FeCl<sub>3</sub>) or Br<sub>2</sub> (in the presence of AlBr<sub>3</sub> or FeBr<sub>3</sub>) →

4. The interaction of alcohols (for example, ethyl or methyl) with carboxylic acids (acetic, salicylic or formic) in an acidic environment

5. Formaldehyde + ammonia (or amine or hydroxylamine or phenylhydrazine) or aldol condensation using the example of aldehyde or ketone → ?

6. Give an example of a five-membered heterocycle (pyrrole, thiophene or furan) and characterize its chemical properties using 3x-4x chemical reactions.

7. Give an example of a reducing (or non-reducing) biose (disaccharide) and write a hydrolysis reaction with its participation

8. Consider the optical isomerism of organic compounds using the example of amino acids (or the structure of an amino acid in an acidic, neutral or alkaline medium) and the ratio of  $\alpha$ -,  $\beta$ - and n-amino acids to heating.
9. Give an open and cyclic (semi-acetal) form for any aldohexose and consider its reaction with methanol (or methyl iodide, or phenol, or carboxylic acid anhydride)
10. Consider the chain elongation (or shortening) reaction using the example of aldopentose
11. Consider the formation of a peptide bond using the example of aminoacetic acid ( $\alpha$ -aminopropionic acid or  $\alpha$ -aminoacetic acid), including with the protection of the corresponding functional groups.
12. Describe the dental cements used for filling dental canals.
13. Consider the photopolymerization of ethylene glycol dimethacrylic ether (give the equation of the polymerization reaction). Give the scope of application of the resulting polymer.
14. Which polymer materials are most often used for the manufacture of removable dentures?
15. Give an example of the metal alloys most commonly used in dentistry.

#### Assessment criteria (assessment tool — Assignments)

Grade	Assessment criteria
outstanding	A high level of training, impeccable command of theoretical material, the student demonstrates a creative approach to solving non-standard situations. The student gave a complete and detailed answer to all the theoretical questions of the ticket, confirming the theoretical material with practical examples. The student actively worked in practical classes. 100% completion of control exam tasks.
excellent	High level of training with minor mistakes. The student gave a complete and detailed answer to all the theoretical questions of the ticket, confirms the theoretical material with practical examples. The student actively worked in practical classes. Completion of control exam tasks by 90% and above.
very good	Good preparation. The student gives an answer to all the theoretical questions of the ticket, but there are inaccuracies in the definitions of concepts, processes, etc. The student actively worked in practical classes. Completion of control exam tasks from 80 to 90%.
good	In general, good preparation with noticeable mistakes or shortcomings. The student gives a complete answer to all theoretical questions of the ticket, but there are inaccuracies in the definitions of concepts, processes, etc. Mistakes are made when answering additional and clarifying questions from the examiner. The student worked in practical classes. Completion of control exam tasks from 70 to 80%.
satisfactory	Minimum sufficient level of training. The student shows a minimum level of theoretical knowledge, makes significant mistakes, but when answering leading questions, he can orient himself correctly and give the correct answer in general terms. The student attended practical classes. Completion of control exam tasks from 50 to 70%.

Grade	Assessment criteria
unsatisfactory	The preparation is insufficient and requires additional study of the material. The student gives erroneous answers, both to the theoretical questions of the ticket, and to the leading and additional questions of the examiner. The student missed most of the practical classes. Completion of control exam tasks up to 50%.
poor	The preparation is absolutely insufficient. The student does not answer the questions posed. The student was absent from most lectures and practical classes. The completion of control exam tasks is less than 20%.

## 6. Учебно-методическое и информационное обеспечение дисциплины (модуля)

Основная литература:

1. Зурабян С.Э. Органическая химия : учебник / Зурабян С.Э.; Лузин А.П.; Тюкавкина Н.А. - Москва : ГЭОТАР-Медиа, 2022. - 384 с. - ISBN 978-5-9704-6787-9., <https://e-lib.unn.ru/MegaPro/UserEntry?Action=FindDocs&ids=868586&idb=0>.

Дополнительная литература:

1. Ким Н. Е., Ким Н. О., Чернова Е. Ю. Общая и неорганическая химия для медицинских специальностей : Учебное пособие / Ким Н. Е., Ким Н. О., Чернова Е. Ю. - Москва : КноРус, 2023. - 191 с. - ISBN 978-5-406-11528-2., <https://e-lib.unn.ru/MegaPro/UserEntry?Action=FindDocs&ids=872501&idb=0>.

Программное обеспечение и Интернет-ресурсы (в соответствии с содержанием дисциплины):

ЭБС «Юрайт». Режим доступа: <http://biblio-online.ru>.

ЭБС «Консультант студента». Режим доступа: <http://www.studentlibrary.ru>.

ЭБС «Лань». Режим доступа: <http://e.lanbook.com/>.

ЭБС «Znanium.com». Режим доступа: [www.znanium.com](http://www.znanium.com).

## 7. Материально-техническое обеспечение дисциплины (модуля)

Учебные аудитории для проведения учебных занятий, предусмотренных образовательной программой, оснащены мультимедийным оборудованием (проектор, экран), техническими средствами обучения.

Помещения для самостоятельной работы обучающихся оснащены компьютерной техникой с возможностью подключения к сети "Интернет" и обеспечены доступом в электронную информационно-образовательную среду.

Программа составлена в соответствии с требованиями ФГОС ВО по направлению подготовки/специальности 31.05.03 - Dentistry.

Авторы: Жданова Мария Леонидовна, кандидат медицинских наук, доцент.

Заведующий кафедрой: Тиунова Наталья Викторовна, доктор медицинских наук.

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