



**INTEGRATED ACADEMIC
STUDIES
OF MEDICINE**

FIRST YEAR

2024/2025.

MEDICAL CHEMISTRY

MEDICAL CHEMISTRY

ECTS 3. There are 3 hours of active classes per week (2 hours of lectures and 1 hour of work in a small group).

TEACHERS

PB	Name and surname	E-mail address	Academic title
1.	Prof. Dr. Nedeljko Manojlović	mtnedeljko@gmail.com	Full professor
2.	Prof. Dr Ratomir Jelic	rjelic@kg.ac.rs	Full professor
3.	Dr. Jovica Tomović	jovicatomovic2011@gmail.com	Assistant professor

MEDICAL CHEMISTRY

Module	Module content	week	lectures	work in a small group	Teacher Head of the module
1	Introduction to Medical chemistry. The importance of chemistry as a science. General chemistry. Basic chemical terms. Chemical laws. Chemical bonds. Types of chemical compounds. Solutions. Chemical Analysis. Kinetics and Equilibrium. Acidity of solutions. pH value. Redox reactions. Inorganic chemistry and chemistry of bioelements. Properties of elements of the main groups of the periodic system of elements. Inorganic compounds. Acids, bases and salts. Chemical reactions. Dispersion systems. Solubility. Concentration of the solution. Electrolytes. Diffusion. Dialysis. Osmosis. Buffers. Biogenic elements, macro and microelements. Organic chemistry. Functional groups. Chemical reactions of organic molecules. Organic compounds. Aliphatic and aromatic organic compounds. Aldehydes. Ketones. Heterocyclic Compounds. Organic compounds with nitrogen and organic compounds with sulfur. Primary biomolecules and their role and importance. Amino acids. Peptides. Proteins. Structure. Carbohydrates. Monosaccharides. Disaccharides and polysaccharides. Lipids. Alkaloids. Instrumental methods in medicine.	5	6	3	Prof. dr Nedeljko Manojlović
Σ 30+15=45					

GRADING SYSTEM:

The grade is equivalent to the number of points earned (see tables). Points are earned in two ways:

ACTIVITY DURING THE LESSON: In this way, a student can earn up to 30 points in total by answering questions that include theoretical questions, questions from practical classes and assignments.

FINAL EXAM: The final exam is taken as an written exam and oral exam.

MODULE		MAXIMUM POINTS		
		activity during classes	final exam	Σ
1	Introduction to Medical chemistry. The importance of chemistry as a science. General chemistry. Basic chemical terms. Chemical laws. Chemical bonds. Types of chemical compounds. Solutions. Chemical Analysis. Kinetics and Equilibrium. Acidity of solutions. pH value. Redox reactions. Inorganic chemistry and chemistry of bioelements. Properties of elements of the main groups of the periodic system of elements. Inorganic compounds. Acids, bases and salts. Chemical reactions. Dispersion systems. Solubility. Concentration of the solution. Electrolytes. Diffusion. Dialysis. Osmosis. Buffers. Biogenic elements, macro and microelements. Organic chemistry. Functional groups. Chemical reactions of organic molecules. Organic compounds. Aliphatic and aromatic organic compounds. Aldehydes. Ketones. Heterocyclic Compounds. Organic compounds with nitrogen and organic compounds with sulfur. Primary biomolecules and their role and importance. Amino acids. Peptides. Proteins. Structure. Carbohydrates. Monosaccharides. Disaccharides and polysaccharides. Lipids. Alkaloids. Instrumental methods in medicine.	30	70	100
	Σ	30	70	100

The final grade is formed as follows:

In order to pass the course, the student must obtain a minimum of 51 points and pass the module. The final grade is formed on the basis of the number of points that can be gained on the following ways:

1. Pre-exam activities – The pre-exam activities are evaluated through the student's answer questions.
2. Final exam – The final exam is organized as a written part of the exam (elimination test) (20 poents) and oral exam (50 poents) and includes a check of knowledge from the entire material covered in theoretical and practical classes. In order to pass the written part of the exam, the student must obtain more than half of the total number of points (11 from 20). In the final exam, the student can achieve a maximum of 70 points.

The method of evaluation based on the points obtained is shown in the following table:

NUMBER OF POINTS ACHIEVED	GRADE
0 - 50	5
51 – 60	6
61 – 70	7
71 – 80	8
81 – 90	9
91 - 100	10

FINAL GRADE

MODULE

**PRE-EXAM
ACTIVITIES
0-30 POINT**

FINAL EXAM

**WRITTEN EXAM
0-20 POINTS
ORAL EXAM
0-70 POINTS**

LITERATURE:

MODULE	TITLE OF THE TEXTBOOK	THE AUTHORS	PUBLISHER	LIBRARY
Introduction to Medical chemistry. The importance of chemistry as a science. Chemical composition of human body. Basic chemical terms. Chemical laws. Chemical bonds. Types of chemical compounds. Solutions. Chemical Analysis. Kinetics and Equilibrium. Acidity of solutions. pH value. Redox reactions. Inorganic chemistry and chemistry of bioelements. Properties of elements of the main groups of the periodic system of elements. Inorganic compounds. Acids, bases and salts. Chemical reactions. Dispersion systems. Solubility. Concentration of the solution. Electrolytes. Diffusion. Dialysis. Osmosis. Buffers. Biogenic elements, macro and microelements. Organic chemistry. Functional groups. Chemical reactions of organic molecules. Organic compounds. Aliphatic and aromatic organic compounds. Aldehydes. Ketones. Heterocyclic Compounds. Organic compounds with nitrogen and organic compounds with sulfur. Primary biomolecules and their role and importance. Amino acids. Peptides. Proteins. Structure. Carbohydrates. Monosaccharides. Disaccharides and polysaccharides. Lipids. Alkaloids. Instrumental methods in medicine.	Bioinorganic Chemistry: Inorganic elements in the Chemistry of Life: An Introduction and Guide.	Kaim W, Schwederski B, Klein A.	Chichester, West Sussex, United Kingdom: Wiley; 2006.	Yes
	Fundamentals of General, Organic, and Biological Chemistry. 7th edition.	McMurry JE, Ballantine DS, Hoeger CA, Peterson VE.	Boston: Pearson; 2012.	Yes
All lectures and material for small group work are available on the website of the Faculty of Medical Sciences: www.medf.kg.ac.rs				

COURSE UNIT CONTENTS

MODULE: GENERAL AND INORGANIC CHEMISTRY, CHEMISTRY OF BIOELEMENTS AND ORGANIC CHEMISTRY

UNIT 1 (FIRST WEEK):

BASIC CHEMICAL TERMS

lectures 2 hours	Small group work 1 hour
The importance of chemistry as a natural science. Chemical composition of human body. Basic chemical terms. Basic chemical laws.	Basic chemical terms

UNIT 2 (FIRST WEEK):

CHEMICAL BONDS

lectures 2 hours	Small group work 1 hour
Chemical bonds. Ionic bond Covalent bond Intermolecular forces	Ionic bond Covalent bond Intermolecular forces

UNIT 3 (FIRST WEEK):

SOLUTIONS. CHEMICAL REACTIONS

lectures 2 hours	Small group work 1 hour
Solution. Water. Concentration. Diffusion. Osmosis. Chemical reactions. Redox reactions in biological systems. Chemical kinetics.	Preparation of the solution Calculation of concentration

UNIT 4 (SECOND WEEK):

INORGANIC COMPOUNDS. ACIDS, BASES AND SALTS. BUFFERS

lectures 2 hours	Small group work 1 hour
Inorganic compounds. Major physiological ions. Acids, bases and salts. pH value. Buffers	Acidity. Calculation of pH values. Buffers

UNIT 5 (SECOND WEEK):

PERIODIC TABLE OF ELEMENTS

lectures 2 hours	Small group work 1 hour
Periodic Table of Elements. Biogenic elements. Elements of the 1st, 2nd and 14th groups and their compounds	Periodic Table of Elements Elements of the 1st, 2nd and 14th groups and their compounds

UNIT 6 (SECOND WEEK):

PERIODIC TABLE OF ELEMENTS

lectures 2 hours	Small group work 1 hour
Elements of the 15th, 16th and 17th groups and their compounds	Elements of the 15th, 16th and 17th groups and their compounds

UNIT 7 (THIRD WEEK):

ORGANIC CHEMISTRY. CLASSIFICATION OF ORGANIC COMPOUNDS

lectures 2 hours	Small group work 1 hour
Halogen elements Organic chemistry. Functional group Alkanes, alkenes, alkynes and dienes Aromatic compounds	Functional group Alkanes, alkenes, alkynes and dienes Aromatic compounds

UNIT 8 (THIRD WEEK):

ORGANIC OXYGEN COMPOUNDS AND ALKYL HALIDES

lectures 2 hours	Small group work 1 hour
Alkyl halides Alcohols, ethers, epoxides and phenols	Alkyl halides Alcohols, ethers, epoxides and phenols

UNIT 9 (THIRD WEEK):

CARBONYL COMPOUNDS. ALDEHYDES AND KETONES

lectures 2 hours	Small group work 1 hour
Aldehydes and ketones	Aldehydes and ketones

UNIT 10 (FOURTH WEEK):

CARBOXYLIC ACIDS. ESTER. ORGANIC SULFUR COMPOUNDS. ORGANIC NITROGEN COMPOUNDS

lectures 2 hours	Small group work 1 hour
Carboxylic acids and functional derivatives Esters Organic sulfur compounds Organic nitrogen compounds	Carboxylic acids and functional derivatives Esters Organic sulfur compounds Organic nitrogen compounds

UNIT 11 (FOURTH WEEK):

HETEROCYCLIC COMPOUNDS. AMINO ACIDS, PEPTIDES AND PROTEINS

lectures 2 hours	Small group work 1 hour
Heterocyclic compounds Amino acids	Heterocyclic compounds Amino acids

UNIT 12 (FOURTH WEEK):

SECONDARY METABOLITES. ALKALOIDS

lectures 2 hours	Small group work 1 hour
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Secondary metabolites. Alkaloids

Secondary metabolites. Alkaloids

UNIT 13 (FIFTH WEEK):

PEPTIDES AND PROTEINS

lectures 2 hours	Small group work 1 hour
Peptides and proteins	Peptides and proteins

UNIT 14 (FIFTH WEEK):

CARBOHYDRATES

lectures 2 hours	Small group work 1 hour
Carbohydrates Mono-, di- and polysaccharides	Carbohydrates Mono-, di- and polysaccharides

UNIT 15 (FIFTH WEEK):

LIPIDS

lectures 2 hours	Small group work 1 hour
Lipids. Fatty acids. Phospholipids	Lipids. Fatty acids. Phospholipids

LESSON SCHEDULE FOR THE SUBJECT MEDICAL CHEMISTRY

module	week	type	the name of the lesson	наставник
1	1	L	The importance of chemistry as a natural science. Chemical composition of human body. Basic chemical terms. Basic chemical laws.	Prof. Dr. Nedeljko Manojlović
			Chemical bonds. Ionic bond Covalent bond Intermolecular forces	Prof. Dr. Nedeljko Manojlović
			Solution. Water. Concentration. Diffusion. Osmosis. Chemical reactions. Redox reactions in biological systems. Chemical kinetics.	Prof. Dr. Nedeljko Manojlović
1	1	SGW	Basic chemical terms	Prof. Dr. Nedeljko Manojlović Ass. Prof. Dr. Jovica Tomović
			Ionic bond Covalent bond Intermolecular forces	
			Preparation of the solution. Calculation of concentration.	
1	2	L	Inorganic compounds. Major physiological ions. Acids, bases and salts. pH value. Buffers	Prof. Dr. Nedeljko Manojlović
			Periodic Table of Elements. Biogenic elements. Elements of the 1st, 2nd and 14th groups and their compounds.	Prof. Dr. Nedeljko Manojlović
			Elements of the 15th, 16th and 17th groups and their compounds	Prof. Dr. Nedeljko Manojlović
1	2	SGW	Acidity. Calculation of pH values. Buffers	Prof. Dr. Nedeljko Manojlović Ass. Prof. Dr. Jovica Tomović
			Periodic Table of Elements. Elements of the 1st, 2nd and 14th groups and their compounds.	
			Elements of the 15th, 16th and 17th groups and their compounds	

LESSON SCHEDULE FOR THE SUBJECT MEDICAL CHEMISTRY

module	week	type	the name of the lesson	наставник
1	3	L	Halogen elements Organic chemistry. Functional group Alkanes, alkenes, alkynes and dienes Aromatic compounds	Prof. Dr. Nedeljko Manojlović
			Alkyl halides Alcohols, ethers, epoxies and phenols	Prof. Dr. Nedeljko Manojlović
			Aldehydes and ketones	Prof. Dr. Nedeljko Manojlović
1	3	SGW	Functional group. Alkanes, alkenes, alkynes and dienes Aromatic compounds	Prof. Dr. Nedeljko Manojlović Ass. Prof. Dr. Jovica Tomović
			Alkyl halides Alcohols, ethers, epoxies and phenols	
			Aldehydes and ketones Carboxylic acids and functional derivatives	
1	4	L	Carboxylic acids and functional derivatives Estri Organic sulfur compounds Organic nitrogen compounds	Prof. Dr. Nedeljko Manojlović
			Heterocyclic compounds. Amino acids.	Prof. Dr. Nedeljko Manojlović
			Secondary metabolites Alkaloids	Prof. Dr. Nedeljko Manojlović
1	4	SGW	Esters Organic sulfur compounds Organic nitrogen compounds	Prof. Dr. Nedeljko Manojlović Ass. Prof. Dr. Jovica Tomović

LESSON SCHEDULE FOR THE SUBJECT MEDICAL CHEMISTRY

module	week	type	the name of the lesson	наставник
			Heterocyclic compounds Amino acids	
			Secondary metabolites Alkaloids	
1	5	L	Peptides and proteins	Prof. Dr. Nedeljko Manojlović
			Carbohydrates Mono-, di- and polysaccharides	Prof. Dr. Nedeljko Manojlović
			Lipids. Fatty acids. Phospholipids	Prof. Dr. Nedeljko Manojlović
1	5	SGW	Peptides and proteins	Prof. Dr. Nedeljko Manojlović Ass. Prof. Dr. Jovica Tomović
			Carbohydrates Mono-, di- and polysaccharides	
			Lipids. Fatty acids. Phospholipids	
		EX1	WRITTEN EXAM	
		EX2	ORAL EXAM	

Examination committee: Prof. Dr. Nedeljko Manojlović, chairman of the committee, Prof. Dr. Ratomir Jelić and ass. Prof. Dr. Jovica Tomović