MEDICAL CHEMISTRY

INTEGRATED ACADEMIC STUDIES OF MEDICINE

FIRST YEAR

2024/2025.

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

РБ	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**

<u>The final grade is formed as follows:</u>

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 answers to five questions.

2. Final exam – The final exam is organized as a written exam (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 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. 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.	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 Basic chemical terms. Basic chemical laws	Basic chemical terms

UNIT 2 (FIRST WEEK):

CHEMICAL BONDS

lectures 2 hours	Small group work 1 hour
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 Concentration Chemical reactions	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
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 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. ESTRI. 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
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

WEEKLY COURSE SCHEDULE

COURSE	WEDNESDAY	THURSDAY	FRIDAY
MEDICAL CHEMISTRY from 02.10. to 01.11.	**LECTURES** **13:00 - 17:30** (H3) **PRACTICE** **17:35 - 20:35** (H44)	**PRACTICE** **08:00 - 11:00** (H44)	**PRACTICE** **17:35 - 20:35** (R18)

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. Basic chemical terms. Basic chemical laws.	Prof. Dr. Nedeljko Manojlović
			Ionic bond Covalent bond Intermolecular forces	Prof. Dr. Nedeljko Manojlović
			Solution Concentration Chemical reactions	Prof. Dr. Nedeljko Manojlović
1	**1**	**SGW**	Basic chemical terms	Prof. Dr. Nedeljko Manojlović Dr. Jovica Tomović
			Ionic bond Covalent bond Intermolecular forces	
			Preparation of the solution. Calculation of concentration.	
1	**2**	**L**	Acids, bases and salts. pH value. Buffers	Prof. Dr. Nedeljko Manojlović
			Periodic Table of 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 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 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 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 Dr. Jovica Tomović
			Carbohydrates Mono-, di- and polysaccharides	
			Lipids. Fatty acids. Phospholipids	
		EX1	**WRITTEN EXAM**	
		EX2	**ORAL EXAM**	

Committee for taking the oral exam: Prof. Dr. Nedeljko Manojlović, chairman of the committee, Prof. Dr. Ratomir Jelić and Dr. Jovica Tomović