



Pharmacy - Integrated academic studies

FIRST YEAR OF STUDY

2025/2026.

GENERAL AND INORGANIC CHEMISTRY

Subject:

GENERAL AND INORGANIC CHEMISTRY

The course is evaluated with 8 ECTS. There are 6 hours of active teaching per week (4 hours of lectures and 2 hours of work in a small group)

TEACHERS AND ASSOCIATES:

	Name and surname	E-mail address	Title
1.	Ratomir Jelić	rjelic@kg.ac.rs	Full Professor
2.	Snežana Jovanović Stević	snezanaj@kg.ac.rs	Assistant Professor
3.	Milos Nikolić	milos.nikolic@fmn.kg.ac.rs	Associate Professor
4.	Nikola Nedeljković	nikola.nedeljkovic@fmn.kg.ac.rs	Assistant Professor

COURSE STRUCTURE:

Module	Module name	Week	Lectures	Work in a small group	Teacher-supervisor module
1	General chemistry - Matter: Its Properties and Measurement. Atoms and the Atomic Theory. Chemical compounds. Chemical reactions. Chemical bonding, Intermolecular forces. Solutions and their physical properties. Principles of chemical equilibrium. Acids and bases. Additional aspects of acid-base equilibria. Buffers, Solubility and complex-ion equilibria.	9	4	2	Doc. Dr. Snežana Jovanović Stević
2	Inorganic chemistry - Chemistry of the main-group elements, transition elements - properties, production and application in pharmacy.	6	4	2	Doc. Dr. Snežana Jovanović Stević
					$\Sigma 54 + 36 = 90$

EVALUATION:

Activity during exercises: 20 points

Teaching colloquium: 30 points

FINAL EXAM:

Final test: 50 points

For a student to pass the exam, he must achieve more than 50 percent of points on each of the defined elements of pre-exam activities, i.e., the final exam. The condition for the student to take the final exam is to pass the pre-exam activities in advance.

Assessment method based on points earned:

Grading system		
Grade	No. of points	Description
10	91-100	Excellent
9	81-90	Exceptionally good
8	71-80	Very good
7	61-70	Good
6	51-60	Passing
5	< 51	Failing

LITERATURE:

Module	Textbook title	Authors	Publisher	the Library
General chemistry - Matter: Its Properties and Measurement. Atoms and the Atomic Theory. Chemical compounds. Chemical reactions. Chemical bonding, Intermolecular forces. Solutions and their physical properties. Principles of chemical equilibrium. Acids and bases. Additional aspects of acid-base equilibria. Buffers, Solubility and complex-ion equilibria.	General Chemistry - Principles and Modern Applications	Ralph Petrucci, F. Herring, Jeffry Madura, Carey Bissonnette	Pearson Canada Inc., Toronto, Ontario, 2011.	
	Chemistry	Chang R.	Tata Mcgraw-Hill Publishing Company Limited, 1998.	
	Essentials of Physical Chemistry	Arun Bahl, B.S. Bahl, G.D. Tuli	S. CHAND, New Delhi, India	
	Practicum in general and inorganic chemistry - For pharmacy students	R.M. Jelic, N.V. Nedeljkovic	Unpublished material, 2023.	
Inorganic chemistry - Chemistry of the main-group elements, transition elements - properties, production and application in pharmacy.	General Chemistry - Principles and Modern Applications	Ralph Petrucci, F. Herring, Jeffry Madura, Carey Bissonnette	Pearson Canada Inc., Toronto, Ontario, 2011.	
	Essentials of Inorganic Chemistry - For Students of Pharmacy, Pharmaceutical Sciences and Medicinal Chemistry	Katja A. Strohfeldt	John Wiley & Sons, Ltd. 2015.	
	Practicum in general and inorganic chemistry - for pharmacy students	R.M. Jelic, N.V. Nedeljkovic	Unpublished material, 2023.	
All lectures can be found on the website of the Faculty of Medicine: www.medf.kg.ac.rs				

THE PROGRAM:

FIRST MODULE: GENERAL CHEMISTRY

TEACHING UNIT 1 (FIRST WEEK):

CHEMISTRY AS A SCIENCE

Lectures: 4 hours	Exercises: 2 hours
Matter and energy. Chemical symbols, formulas and equations. Basic chemical laws.	Introduction to the laboratory, laboratory utensils, laboratory equipment and laboratory techniques. Application of basic chemical laws.

TEACHING UNIT 2 (SECOND WEEK):

ATOMS AND THE ATOMIC THEORY AND CHEMICAL BONDING

Lectures: 4 hours	Exercises: 2 hours
Early Chemical Discoveries and the Atomic Theory. Types of Chemical Bonds. Lewis Theory. Introduction to the Valence-Bond Method. Molecular Orbital Theory.	Basic chemical concepts. Determination of the relative atomic mass of magnesium. Predicting the structure of molecules. Prediction of lipophilic and hydrophilic properties of molecules.

TEACHING UNIT 3 (THIRD WEEK):

INTERMOLECULAR FORCES: GASES, LIQUIDS AND SOLIDS

Lectures: 4 hours	Exercises: 2 hours
Intermolecular Forces. Some Properties of Gases. Some Properties of Liquids. Some Properties of Solids. Phase Diagrams. Crystal Structures	States of matter and intermolecular forces and their Importance in the living world.

TEACHING UNIT 4 (FOURTH WEEK):

CHEMICAL REACTIONS

Lectures: 4 hours	Exercises: 2 hours
Chemical Reactions and Chemical Equations. Chemical Reactions in Solution. Oxidation-Reduction Reactions: Some General Principles. Thermochemistry.	Types of chemical reactions. Demonstration experiments of different types of reactions. Influence of molecule structure on molecule behavior. Forms of energy in biological systems.

TEACHING UNIT 5 (FIFTH WEEK):

CHEMICAL COMPOUNDS

Lectures: 4 hours	Exercises: 2 hours
Types of Chemical Compounds and Their Formulas. Nomenclature of Inorganic Compounds. Complex Ions and Coordination Compounds.	Preparation of oxides, bases and salts. Types and properties of inorganic compounds. Metal Complexes in the Body.

TEACHING UNIT 6 (SIXTH WEEK):

SOLUTIONS AND THEIR PHYSICAL PROPERTIES

Lectures: 4 hours	Exercises: 2 hours
Types of Solutions. Solution Concentration. Colligative properties of the solution. Chemical Kinetics. Principles of Chemical Equilibrium.	Types of Solutions. Colligative properties of the solution. Chemical Kinetics. Principles of Chemical Equilibrium. The concentration of solutions - Calculations in chemistry. Factors Affecting Chemical Equilibrium.

TEACHING UNIT 7 (SEVENTH WEEK):

ELECTROLYTE SOLUTIONS

Lectures: 4 hours	Exercises: 2 hours
Electrolyte solutions. Electrolyte properties. The role of electrolytes in the body. Acids and bases. Theories of Acids and Bases.	Diffusion, osmosis and preparation of saline. Acid-Base Reactions. Electrical Conductivity of Aqueous Solutions. Importance of acids and bases in our daily life.

TEACHING UNIT 8 (EIGHTH WEEK):

EQUILIBRIA IN ELECTROLYTE SOLUTIONS

Lectures: 4 hours	Exercises: 2 hours
Equilibria in Electrolyte Solutions. Ionic product of water. pH Value. Equilibria in solutions of acids and bases. Calculating the pH of Acid and Base Solutions	Measurement of pH values of solutions and physiological fluids. Calculating the pH of Acid and Base Solutions.

TEACHING UNIT 9 (NINTH WEEK):

BUFFER SOLUTIONS, SOLUBILITY PRODUCTS AND HYDROLYSIS OF SALTS

Lectures: 4 hours	Exercises: 2 hours
Buffer Solutions. Calculating pH in a Buffer Solution. Important Buffers in Living Systems. Solubility Product Constant. Hydrolysis of Salt Solutions.	Preparing Buffer Solutions. Calculating pH of Buffer Solutions. Biologically important buffers. Solubility Product Constant. Hydrolysis of Salt Solutions.

SECOND MODULE: INORGANIC CHEMISTRY

TEACHING UNIT 10 (TENTH WEEK):

HYDROGEN AND ALKALI METALS

Lectures: 4 hours	Exercises: 2 hours
Periodic Trends and Charge Density. Hydrogen and Alkali Metals - General properties, Production, Compounds and Pharmaceutical applications.	Reactions of Hydrogen and Alkali Metals. Importance of Hydrogen and Alkali Metals and their compounds in our daily life?

TEACHING UNIT 11 (ELEVENTH WEEK):

CHEMISTRY OF GROUP 2 AND 17 ELEMENTS

Lectures: 4 hours	Exercises: 2 hours
Elements of groups 2 and 17 - General properties, Production, Compounds and Pharmaceutical applications.	Reactions of Group 2 and 17 elements. Importance of elements 2 and 17 of the group and their compounds in daily life.

TEACHING UNIT 12 (TWELFTH WEEK):

CHEMISTRY OF GROUP 13 AND 14 ELEMENTS

Lectures: 4 hours	Exercises: 2 hours
Elements of groups 13 and 14 - General properties, Production, Compounds and Pharmaceutical applications.	Reactions of Group 13 and 14 elements. Importance of elements 13 and 14 of the group and their compounds in our daily life.

TEACHING UNIT 13 (THIRTEENTH WEEK):

CHEMISTRY OF GROUP 15 AND 16 ELEMENTS

Lectures: 4 hours	Exercises: 2 hours
Elements of groups 15 and 16 - General properties, Production, Compounds and Pharmaceutical applications.	Reactions of Group 15 and 16 elements. Importance of elements 13 and 14 of the group and their compounds in our daily life.

TEACHING UNIT 14 (SIXTEENTH WEEK):

CHEMISTRY OF GROUP 11 AND 12 ELEMENTS

Lectures: 4 hours	Exercises: 2 hours
Elements of groups 11 and 12 - General properties, Production, Compounds and Pharmaceutical applications.	Reactions of Group 11 and 12 elements. Importance of elements 11 and 12 of the group and their compounds in our daily life.

TEACHING UNIT 15 (FIFTEENTH WEEK):

CHEMISTRY OF TRANSITION ELEMENTS

lectures 4 hours	exercise 2 hours
Transition Elements - General properties, Production, Compounds and Pharmaceutical applications.	Reactions of Transition Elements. Importance of Transition Elements and their compounds in our daily life.

TEACHING SCHEDULE FOR THE SUBJECT OF GENERAL AND INORGANIC CHEMISTRY

module	week	type	Methodical Unit Title	
1	1	L	Matter and energy. Chemical symbols, formulas and equations. Basic chemical laws.	Prof. Dr. Ratomir Jelić Doc. Dr. Snežana Jovanović Stević
		E	Introduction to the laboratory, laboratory utensils, laboratory equipment and laboratory techniques. Application of basic chemical laws.	Prof. Dr. Ratomir Jelić Prof. Dr. Miloš Nikolić Doc. Dr. Nikola Nedeljković
	2	L	Early Chemical Discoveries and the Atomic Theory. Types of Chemical Bonds. Lewis Theory. Introduction to the Valence-Bond Method. Molecular Orbital Theory.	Prof. Dr. Ratomir Jelić Doc. Dr. Snežana Jovanović Stević
		E	Basic chemical concepts. Determination of the relative atomic mass of magnesium. Predicting the structure of molecules. Prediction of lipophilic and hydrophilic properties of molecules.	Prof. Dr. Ratomir Jelić Prof. Dr. Miloš Nikolić Doc. Dr. Nikola Nedeljković
	3	L	Intermolecular Forces. Some Properties of Gases. Some Properties of Liquids. Some Properties of Solids. Phase Diagrams. Crystal Structures	Prof. Dr. Ratomir Jelić Doc. Dr. Snežana Jovanović Stević
		E	States of matter and intermolecular forces and their Importance in the living world.	Prof. Dr. Ratomir Jelić Prof. Dr. Miloš Nikolić Doc. Dr. Nikola Nedeljković
	4	L	Chemical Reactions and Chemical Equations. Chemical Reactions in Solution. Oxidation-Reduction Reactions: Some General Principles. Thermochemistry.	Prof. Dr. Ratomir Jelić Doc. Dr. Snežana Jovanović Stević
		E	Types of chemical reactions. Demonstration experiments of different types of reactions. Influence of molecule structure on molecule behavior. Forms of energy in biological systems.	Prof. Dr. Ratomir Jelić Prof. Dr. Miloš Nikolić Doc. Dr. Nikola Nedeljković
	5	L	Types of Chemical Compounds and Their Formulas. Nomenclature of Inorganic Compounds. Complex Ions and Coordination Compounds.	Prof. Dr. Ratomir Jelić Doc. Dr. Snežana Jovanović Stević
		E	Preparation of oxides, bases and salts. Types and properties of inorganic compounds. Metal Complexes in the Body.	Prof. Dr. Ratomir Jelić Prof. Dr. Miloš Nikolić Doc. Dr. Nikola Nedeljković

TEACHING SCHEDULE FOR THE SUBJECT OF GENERAL AND INORGANIC CHEMISTRY

module	week	type	Methodical Unit Title	наставник
1	6	L	Types of Solutions. Solution Concentration. Colligative properties of the solution. Chemical Kinetics. Principles of Chemical Equilibrium.	Prof. Dr. Ratomir Jelić Doc. Dr. Snežana Jovanović Stević
		E	Types of Solutions. Colligative properties of the solution. Chemical Kinetics. Principles of Chemical Equilibrium. The concentration of solutions - Calculations in chemistry. Factors Affecting Chemical Equilibrium.	Prof. Dr. Ratomir Jelić Prof. Dr. Miloš Nikolić Doc. Dr. Nikola Nedeljković
	7	L	Electrolyte solutions. Electrolyte properties. The role of electrolytes in the body. Acids and bases. Theories of Acids and Bases.	Prof. Dr. Ratomir Jelić Doc. Dr. Snežana Jovanović Stević
		E	Diffusion, osmosis and preparation of saline. Acid-Base Reactions. Electrical Conductivity of Aqueous Solutions. Importance of acids and bases in our daily life.	Prof. Dr. Ratomir Jelić Prof. Dr. Miloš Nikolić Doc. Dr. Nikola Nedeljković
	8	L	Equilibria in Electrolyte Solutions. Ionic product of water. pH Value. Equilibria in solutions of acids and bases. Calculating the pH of Acid and Base Solutions	Prof. Dr. Ratomir Jelić Doc. Dr. Snežana Jovanović Stević
		E	Measurement of pH values of solutions and physiological fluids. Calculating the pH of Acid and Base Solutions.	Prof. Dr. Ratomir Jelić Prof. Dr. Miloš Nikolić Doc. Dr. Nikola Nedeljković
	9	L	Buffer Solutions. Calculating pH in a Buffer Solution. Important Buffers in Living Systems. Solubility Product Constant. Hydrolysis of Salt Solutions.	Prof. Dr. Ratomir Jelić Doc. Dr. Snežana Jovanović Stević
		E	Preparing Buffer Solutions. Calculating pH of Buffer Solutions. Biologically important buffers. Solubility Product Constant. Hydrolysis of Salt Solutions.	Prof. Dr. Ratomir Jelić Prof. Dr. Miloš Nikolić Doc. Dr. Nikola Nedeljković
2	10	L	Periodic Trends and Charge Density. Hydrogen and Alkali Metals - General properties, Production, Compounds and Pharmaceutical applications.	Prof. Dr. Ratomir Jelić Doc. Dr. Snežana Jovanović Stević
		E	Reactions of Hydrogen and Alkali Metals. Importance of Hydrogen and Alkali Metals and their compounds in our daily life?	Prof. Dr. Ratomir Jelić Prof. Dr. Miloš Nikolić Doc. Dr. Nikola Nedeljković

TEACHING SCHEDULE FOR THE SUBJECT OF GENERAL AND INORGANIC CHEMISTRY

module	week	type	Methodical Unit Title	наставник
2	11	L	Elements of groups 2 and 17 - General properties, Production, Compounds and Pharmaceutical applications.	Prof. Dr. Ratomir Jelić Doc. Dr. Snežana Jovanović Stević
		E	Reactions of Group 2 and 17 elements. Importance of elements 2 and 17 of the group and their compounds in daily life.	Prof. Dr. Ratomir Jelić Prof. Dr. Miloš Nikolić Doc. Dr. Nikola Nedeljković
	12	L	Elements of groups 13 and 14 - General properties, Production, Compounds and Pharmaceutical applications.	Prof. Dr. Ratomir Jelić Doc. Dr. Snežana Jovanović Stević
		E	Reactions of Group 13 and 14 elements. Importance of elements 13 and 14 of the group and their compounds in our daily life.	Prof. Dr. Ratomir Jelić Prof. Dr. Miloš Nikolić Doc. Dr. Nikola Nedeljković
	13	L	Elements of groups 15 and 16 - General properties, Production, Compounds and Pharmaceutical applications.	Prof. Dr. Ratomir Jelić Doc. Dr. Snežana Jovanović Stević
		E	Reactions of Group 15 and 16 elements. Importance of elements 13 and 14 of the group and their compounds in our daily life.	Prof. Dr. Ratomir Jelić Prof. Dr. Miloš Nikolić Doc. Dr. Nikola Nedeljković
	14	L	Elements of groups 11 and 12 - General properties, Production, Compounds and Pharmaceutical applications.	Prof. Dr. Ratomir Jelić Doc. Dr. Snežana Jovanović Stević
		E	Reactions of Group 11 and 12 elements. Importance of elements 11 and 12 of the group and their compounds in our daily life.	Prof. Dr. Ratomir Jelić Prof. Dr. Miloš Nikolić Doc. Dr. Nikola Nedeljković
	15	L	Transition Elements - General properties, Production, Compounds and Pharmaceutical applications.	Prof. Dr. Ratomir Jelić Doc. Dr. Snežana Jovanović Stević
		E	Reactions of Transition Elements. Importance of Transition Elements and their compounds in our daily life.	Prof. Dr. Ratomir Jelić Prof. Dr. Miloš Nikolić Doc. Dr. Nikola Nedeljković
			Exam	

