GENERAL AND ORGANIC CHEMISTRY	
GENERAL INFORMATIONS	
Course coordinator	Asst. Prof. Katarina Mišković Špoljarić,MEngProc, PhD
Assistant/Associate	Asst. Prof. Barbara Viljetić, MedBiol et Chem, PhD Asst. Prof.Teuta Opačak-Bernardi, MBiolMol, PhD Asst. Prof. Marijana Leventić, MBiol, PhD
Study Programme	Undergraduate University Study of Medical Laboratory Diagnostics
Status of the course	mandatory
Year of study, semester	1th Year /1th semester
ECTS	**10**
Workload (hours)	Lectures: 60; Seminars: 15; Laboratory exercises: 30
Expected number of students	30-35
COURSE DESCRIPTION	
Course objectives	
Acquisition of knowledge and skills about elementary concepts in general and organic chemistry, including the basics of organic compounds and important biological macromolecules accompanied by chemical and energetic changes during molecular conversion. Knowledge of the kinetics of a chemical reaction, thermodynamic relationships that follow a chemical reaction, as well as the basics of electrochemical processes and nuclear reactions.	
Enrolment requirements and entry competencies	
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Learning outcomes at the Programme level	
1.1, 2.1, 2.2, 2.7	
Learning outcomes at the course level	
After completing lectures, seminars and exercises, independent study and passing the exam, students will be able to: 1. Rank types of substances and basic chemical laws. 2. Predict the electronic structure of atoms and choose the appropriate chemical bond. 3. Compare solutions, types of solutions, electrolytes, acids and bases. 4. Determine the order of the chemical reaction, and evaluate the influence of individual factors on chemical kinetics. 5. Compare different types of chemical equilibrium, followed by an appropriate example 6. Interpret the theory of proteolytic and oxidation/reduction reactions. 7. Compare the types of reactions in the chemistry of organic compounds 8. Apply acquired knowledge to solving computational tasks in general and organic chemistry, as well as problems through laboratory exercises. 9. Choose a method of analysis for effective solving of laboratory tasks.	
Course content	
Lectures: Structure of atoms and molecules. Basic concepts and generally accepted symbols in chemistry. Writing formulas and equations. Quantum theory. Atomic orbitals and hybridization. Periodic system and classification of chemical elements. Theory of molecular orbitals. Types of chemical bonds (covalent, ionic, metallic, hydrogen bond). Electronegativity. Polar bonds and dipoles. Structure and properties of water and ice. Crystal structures (bonds in solids; arrangement in a crystal lattice; types of crystal lattices; phase diagrams). *Solutions* (solubility; colligative properties; reactions in aqueous solutions). Acids and bases. Salt hydrolysis. Electrolyte solutions. pH and buffers. Buffer action mechanism. Biological buffers. Colloidal solutions. *Chemical kinetics*. Order of reaction. Reaction mechanism. Free radicals. The rate of chemical reactions and factors	

affecting the rate. Catalysis. Collision theory. Transition state theory. The law of mass action. Equilibrium constant. Kinetic and thermodynamic equilibrium conditions. The influence of external factors on balance. Le Chatelier's principle. Photochemical reactions. Absorption of light in solution. Lambert-Beer law. *Gases.* Gas laws. Ideal gas and ideal gas equation of state. Dalton's law. Kinetic theory of gases. Equation of state of a real gas. Raoult's law. *Thermodynamics***.** Basic terms. Work and heat. Principle of conservation of energy (paragraph I of thermodynamics). Thermodynamic quantities – functions of the state of the system. II. paragraph of thermodynamics. Free (Gibbs) energy and direction of chemical reactions). Energy value of a chemical bond. Calorimetry. *Chemical balance*. Law on mass action. Equilibrium constant. Kinetic and thermodynamic conditions of equilibrium. The influence of external factors on balance. The law of dilution. Equilibrium in a homogeneous and heterogeneous system. *Electrochemical processes*. Galvanic article and reactions on electrodes. Standard potential. EMS of the article. Nernst equation. Corrosion and electrolysis. *Nuclear chemistry*. Radioisotopes and their application. *Chemistry of organic compounds*. Division of organic compounds. Types of reactions in the chemistry of organic compounds. Isomers and isomerism. Organic compounds containing oxygen: alcohols and phenols, ethers, aldehydes and ketones, carboxylic acids and their derivatives. Chemical properties and characteristic reactions. Organic compounds with nitrogen and sulfur: chemical properties and characteristic reactions. Heterocyclic compounds. Biologically significant derivatives and molecules.

Seminars: Physical quantities - SI system. Calculation from chemical equations. Reactions in aqueous solutions. Chemical kinetics and chemical equilibrium. Acids and bases - pH. Gas laws. Thermodynamics - tasks with the application of thermodynamic laws. Electrochemistry and organic chemistry.

Exercises: General rules of work in the laboratory. Measurement of mass and volume. Spectroscopy. FTIR, UV-VIS. Separation of the mixture based on the difference in solubility. The rate of a chemical reaction. Volumetric analysis. Working with gases. Thermodynamics: application of thermodynamic laws and determination of system entropy. Chromatography. Reactions proving organic compounds. Practical work.

Mode of teaching

Lectures, Problem solving seminars, Laboratory exercises

Student obligations

Attendance at all forms of classes is mandatory. Student is obligated to attend all knowledge tests. The student may be absent from 30% of each of the forms of classes, provided that the absence is justified. An exercise or a seminar which has not been completed must be made up through written assessment. To work in the laboratory, student must have prescribed work clothes (white laboratory coat) and student laboratory handbook. The successful performance of laboratory exercises requires prior preparation of the student.

Monitoring student work *(Connectivity of learning outcomes, teaching methods and grading)*

Teaching activity	ECTS	Learning outcome	Student activity	Assessment methods	Grade points	
					Min.	Max.
Attending classes	0.5	1-9	Class attendance	Attendance record	3	4
Seminars	1.5	1-9	Preparation of seminar	Seminar presentation	6	8
Exercises	2	8-9	Entrance exams, performing	Work diary, entrance exam,	9	18

			exercises, keeping work diary	independent final exercise		
Knowledge test (partial exams)	2	1-9	Studying for partial exams	2 partial exams	12	30
Final exam	4	1-9	Studying for the final exam	Written exam	12	20
				Oral exam	8	20
Total	**10**				**50**	**100**

Evaluation of the final written and oral exam:
Evaluation of the written part of the final exam

Percentage of correct answers (%)	Grade points
60.00 – 64.99	12
65.00 – 69.99	13
70.00 - 74.99	14
75.00 – 79.99	15
80.00 - 84.99	16
85.00 – 89.99	17
90.00 - 94.99	18
95.00 - 100	20

Calculation of final grade:
Grade points earned in the final exam are added to the grade points earned during the course. Grading in the ECTS system is done by absolute distribution, i.e. based on total achievement and is compared to the numerical system in the following manner: A - excellent (5): 80-100 grade points; B - very good (4): 70-79.99 grade points; C - good (3): 60-69.99 grade points; D - sufficient (2): 50-59.99 grade points.

Required reading (available in the library and through other media)

Title	Number of copies in the library	Availability through other media
Filipović, Lipanović. Opća i organska kemija 1; Školska knjiga Zagreb, 1995.	7	
Sikirica M. Stehiometrija. Školska knjiga Zagreb, 2008.	10	
John McMurry. Osnove organske kemije, hrvatsko izdanje, urednice Č. Milin i G. Čanadi Jurešić, Zrinski, Čakovec 2014.	10	
Glavaš-Obrovac Lj. i sur. Priručnik za seminare i vježbe iz Medicinske kemije i biokemije 1, Medicinski fakultet Osijek, 2014.		On line

Additional reading

Silberberg, MS: Chemistry, The molecular nature of matter and change, 3. Izdanje, McGraw Hill, 2003.

Course evaluation procedures

Anonymous, quantitative, standardised student survey on the course and the teacher's work implemented by the Quality improvement office of the Faculty of Medicine Osijek.