

Course Syllabus**I. General Information**

Course name	General and inorganic chemistry
Programme	Biotechnology
Level of studies (BA, BSc, MA, MSc, long-cycle MA)	BSc
Form of studies (full-time, part-time)	part-time
Discipline	Biological sciences
Language of instruction	English

Course coordinator/person responsible	dr Artur Banach
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Type of class (<i>use only the types mentioned below</i>)	Number of teaching hours	Semester	ECTS Points
lecture	30	I	7
tutorial	20	I	
classes	30	I	
laboratory classes			
workshops			
seminar			
introductory seminar			
foreign language classes			
practical placement			
field work			
diploma laboratory			
translation classes			
study visit			

Course pre-requisites	Knowledge of chemistry on high school level, knowledge of physics and mathematics on the basic, high school level.
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II. Course Objectives

Familiarization students with basic chemical laws.	
Familiarization students with atom and chemical particle structure and the importance of the periodic table.	
Familiarization students with the chemical concepts used for description of chemical substances and processes, chemical formulas and reactions as well as concentrations of solutions, electrolytic dissociation and pH.	
Discussion of the properties of the representative elements, their compounds, synthesis and application.	

III. Course learning outcomes with reference to programme learning outcomes

Symbol	Description of course learning outcome	Reference to programme learning outcome
KNOWLEDGE		
W_01	Student describes issues in the field of physics, mathematics and chemistry required to understand and interpret basic natural phenomena and processes	K_W02
W_02	Students presents the principles of health, safety work and ergonomics, indicates the psychophysical possibilities of a human in the work environment in laboratory of chemistry	K_W09
SKILLS		
U_01	Student carries out observations and performs chemical measurements	K_U02
U_02	Student describes, explains and interprets chemical and physicochemical phenomena at an advanced level	K_U08
U_03	Student performs qualitative and quantitative analyzes in chemistry by using classical and instrumental method	K_U10
U_04	Student prepares a written study on issues related to inorganic chemistry in English language using the scientific language	K_U13
U_05	Student learns independently in a targeted manner in the field of chemistry, updates his/her knowledge and skills, applies new research techniques and plans his professional development	K_U17
SOCIAL COMPETENCIES		
K_01	Student possesses appropriate habits required to the work in scientific chemistry laboratories, proceeds according to work safety regulations, knows how to react in states of danger	K_K04

IV. Course Content

Lecture: Fundamentals of chemistry – general terms and chemical laws. Classification of matter, structure of matter, symbols and formulas. Matter and energy: physical and chemical change. Quantitative chemical relationships: atomic weight, moles and molar mass, quantitative measures and recalculations, stoichiometric calculations based on formulas and equations. Structure of atoms, atomic subparticles, electronic configurations. Periodic table of elements. Chemical bonding and intermolecular attractions: types of chemical bonds, shape and polarity of molecules, intermolecular forces, physical state of matter and solubility related to molecular structure. Mixtures: homo- and heterogeneous solutions, dispersion, percentage, molar and other ways to express quantitative composition, mixture separation. Reactions in solution: dissociation, ionic reactions, dissociation constant, Ostwald law, pH, salt hydrolysis, buffer solutions, precipitation. Basic inorganic chemistry: classification and properties of inorganic compounds, characteristics of main group elements, compounds of copper, iron, chromium and manganese.

Classes: Safety principles for work in the Chemistry Laboratory. General laboratory glassware and accessories used in the chemical laboratory. Quantitative Analysis: (1) Standardization of hydrochloric acid concentration with borax. (2) Determination of sodium hydroxide by titration method. Determination of salicylic acid by titration method. Qualitative analysis: (1) Qualitative analysis of selected cations. (2) Qualitative analysis of selected anions. (3) Qualitative analysis of the

mixture of selected cations and anions. Reaction of oxidation and reduction (redox): (1) Hydrogen peroxide as oxidizer and reductor. (2) Study on pH influence on the direction of redox reaction. Buffers. Preparation of buffers and examination of their properties. Chemical data processing.

Tutorial: Conversion of number of substance: an atom, molecule, atomic and molecular weight, molecular weight, concept of mole, number of moles, molar volume, and density. The equation of state of an ideal gas. The stoichiometry of chemical reaction: determining the chemical formulas based on percentage composition, calculate the weight, the number of moles and volume of reagent in chemical reaction. Types of solution concentrations: percent concentration, mole, the mole fraction. Conversion of concentration, mixing and dilution of solutions. Equilibria in solutions of electrolytes: ionic dissociation, electrolytes strong and weak, constant and degree of dissociation, Ostwald dilution law, ionic product of water, pH of solutions, salt hydrolysis, buffers, solubility product.

V. Didactic methods used and forms of assessment of learning outcomes

Symbol	Didactic methods (choose from the list)	Forms of assessment (choose from the list)	Documentation type (choose from the list)
KNOWLEDGE			
W_01	Conventional lecture	Written exam	Written exam Completed and evaluated test
	Laboratory analysis	Test	
W_02	Laboratory analysis	Observation	Rating card / Report from observation
SKILLS			
U_01	Laboratory classes	Report	Protocol / Print / Report file
U_02	Laboratory analysis	Test	Completed and evaluated test
U_03	Laboratory classes	Report	Protocol / Print / Report file
U_04	Laboratory classes	Report	Protocol / Print / Report file
U_05	Practical exercises	Test	Completed and evaluated test
SOCIAL COMPETENCIES			
K_01	Laboratory classes	Observation	Rating card / Report from observation

VI. Grading criteria, weighting factors.....

Lecture: Written exam in the form of test - 100%,

Classes and tutorial: Written tests (80%), preparation of written reports (8%), assessment of student activity in classes (performance of practical exercises, activity, ability to work in a group, compliance with health and safety rules, 12%).

Mark	Evaluation criteria	
very good (5)	the student realizes the assumed learning outcomes at a very good level	the student demonstrates knowledge of the education content at the level of 91-100%

overgood (4.5)	the student accomplishes the assumed learning outcomes an over good level	the student demonstrates knowledge of the education content at the level of 86-90 %
good(4)	the student accomplishes the assumed learning outcomes at a good level	the student demonstrates knowledge of the education content at the level of 71-85%
quite good(3.5)	the student accomplishes the assumed learning outcomes at a quite good level	the student demonstrates knowledge of the education content at the level of 66-70%
sufficient (3)	the student accomplishes the assumed learning outcomes at a sufficient level	the student demonstrates knowledge of the education content at the level of 51-65%
insufficient (2)	the student accomplishes the assumed learning outcomes at an insufficient level	the student demonstrates knowledge of the education content below the level of 51%

VII. Student workload

Form of activity	Number of hours
Number of contact hours (with the teacher)	80
Number of hours of individual student work	95

VIII. Literature

Basic literature
Petrucci R.H., Herring F.G., Madura J.D., Bissonnette C., General Chemistry: Principles and Modern Applications with Mastering Chemistry, 978-0136121497, 2010. Crichton R., Biological Inorganic Chemistry - A New Introduction to Molecular Structure and Function, 2nd Edition. Elsevier, 2012.
Additional literature
Brady J.E., Russel J.W., Holum J.R., Chemistry: Matter and Its Changes, 3rd edition. 978-0471184764, John Wiley & Sons, Inc. 2000.