



## Subject card

Subject name and code	Chemistry, PG_00047713						
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering						
Date of commencement of studies	October 2021	Academic year of realisation of subject			2021/2022		
Education level	first-cycle studies	Subject group			Obligatory subject group in the field of study		
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	1	Language of instruction			Polish		
Semester of study	1	ECTS credits			3.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Chemistry and Technology of Functional Materials -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Elżbieta Luboch					
	Teachers	prof. dr hab. inż. Elżbieta Luboch dr inż. Radosław Pomećko dr inż. Mariusz Szkoda dr inż. Konrad Trzciński					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	30.0	0.0	0.0	60
	E-learning hours included: 0.0 Adresy na platformie eNauczanie: CHEMIA dla Inżynierii Biomedycznej - Moodle ID: 17498 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=17498">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=17498</a>						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM		
	Number of study hours	60	5.0	10.0	75		
Subject objectives	The main objective of the course is to introduce students to issues of general chemistry with particular emphasis on those that are useful for students of Biomedical Engineering.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_W02] knows and understands, to an advanced extent, selected laws of physics and physical phenomena as well as methods and theories explaining the complex relationships between them, constituting the basic general knowledge in the field of technical sciences related to the field of study	The student can justify the properties of the substance knowing the characteristics of the elements and the way they are combined.			[SW1] Assessment of factual knowledge		
	[K6_U53] can apply equipment used in biomedical diagnostics	Student is able to use the equipment typical for a chemical laboratory.			[SU4] Assessment of ability to use methods and tools		
	[K6_K02] is ready to critically assess possessed knowledge and acknowledge the importance of knowledge in solving cognitive and practical problems	The student understands the importance of knowledge in solving cognitive and practical problems.			[SK5] Assessment of ability to solve problems that arise in practice		
	[K6_W52] Knows and understands, to an advanced extent, selected aspects of chemistry and biochemistry, constituting general knowledge related to the field of study	The student knows and understands selected issues in general and bioorganic chemistry.			[SW1] Assessment of factual knowledge		

Subject contents	<p>LECTURE: Periodic table of elements. Electronic configuration of atoms. Periodic changes in certain quantities: ionisation energy of elements, electron affinity, electronegativity of elements. Atomic and ionic radii. Definitions of certain fundamental terms. Fundamental laws of chemistry, chemical formulae and equations. Chemical bonds: main types of bonds. Covalent bond: description of electrons in molecules based on the electron theory of chemical bonds and theory of molecular orbitals. Bonding and anti-bonding orbitals. Shapes of molecular orbital areas: <math>\sigma</math> and <math>\pi</math> molecular orbitals. Electronic configuration of molecules. Hybridisation of orbitals. Explanation of shapes of molecules based on hybridisation. Delocalised bonds. Aromatic compounds: properties, examples. Explanation of molecule shapes: VSEPR method. Polarisation of chemical bonds. Inter-molecular interactions. Hydrogen bond and its effects on chemical compound physical properties. General characteristics of states of matter. Solid: crystal systems, types of unit cells, ionic, covalent, molecular and metallic crystals. Crystal structure and substance physical properties. Types of chemical reactions. Oxidation and reduction reactions. Oxidation state. Nomenclature of inorganic compounds. Properties of inorganic compounds. Coordination bond. Complex compounds: notion of the central atom and the ligand, examples of complex compounds and their names; properties of complex compounds and their role. Complex compounds: crystal field theory. Organic compounds: classification, nomenclature. Biologically important organic compounds. Organic compounds: properties, reactivity. Mechanisms of organic compound reactions. Chemical thermodynamics: basic terms, first law. Enthalpy of physical changes and chemical reactions. Second law of thermodynamics: entropy, free energy, free energy of reaction, spontaneous processes, equilibrium reactions. Solutions, types of solutions. Properties of water. Physical properties of solutions. Chemical equilibrium. Equilibrium in aqueous solutions. Electrolyte solutions. Ionic and proton theory of acids and bases. pH. Weak electrolytes. Hydrolysis. Ostwald's dilution law. Buffer solutions. Electron theory of acids and bases, HSAB theory. Strong electrolytes, ionic activity and strength. LABORATORY: Concentration of solutions. Acidity of solutions. Qualitative analysis of cations. Qualitative analysis of anions. Identification of organic compounds. Kinetics of chemical reactions. Catalysis in the synthesis of organic compounds. Extraction. Resolution of substances. Precipitation processes. Water demineralisation methods. Colloids. Chromatography. Redox reactions. Electrochemical series of metals. Cells.</p>														
Prerequisites and co-requisites	No requirements														
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="448 786 794 824">Subject passing criteria</th> <th data-bbox="794 786 1141 824">Passing threshold</th> <th data-bbox="1141 786 1487 824">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="448 824 794 880">Test on the ground of the second part of the lecture</td> <td data-bbox="794 824 1141 880">50.0%</td> <td data-bbox="1141 824 1487 880">25.0%</td> </tr> <tr> <td data-bbox="448 880 794 913">Practical exercise</td> <td data-bbox="794 880 1141 913">52.0%</td> <td data-bbox="1141 880 1487 913">50.0%</td> </tr> <tr> <td data-bbox="448 913 794 972">Test on the ground of the first part of the lecture</td> <td data-bbox="794 913 1141 972">50.0%</td> <td data-bbox="1141 913 1487 972">25.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Test on the ground of the second part of the lecture	50.0%	25.0%	Practical exercise	52.0%	50.0%	Test on the ground of the first part of the lecture	50.0%	25.0%
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Recommended reading	Basic literature	<p>1. L. Jones, P. Atkins "Chemia ogólna. Cząsteczki, materia, reakcje" PWN 2009. 2. A. Bielański „Podstawy chemii nieorganicznej” PWN 2002 3. F.A. Cotton, G. Wilkinson, P.L. Gaus „Chemia nieorganiczna. Podstawy” PWN 2002 4. T. Kędryna „Chemia ogólna z elementami biochemii” ZamKor 2004 5. M.J. Sienko, R.A. Plane „Chemia. Podstawy i zastosowania” WNT 2002 6. L. Pajdowski „Chemia ogólna” PWN 1999 7. W. Gałasiński „Chemia medyczna” PZWL 2004 8. P.W. Atkins „Podstawy chemii fizycznej” PWN 1999 9. J. McMurry „Chemia organiczna” PWN 2005 10. red. E. Luboch, M. Bocheńska, J.F. Biernat „Chemia ogólna. Ćwiczenia laboratoryjne” Wyd. PG 2003</p>													
	Supplementary literature	<p>1. W. Kołos, J. Sadlej „Atom i cząsteczka” WNT 2007 2. P.W. Atkins „Przewodnik po chemii fizycznej” PWN 1997 3. P.W. Atkins „Chemia fizyczna” PWN 2007 4. P. Mastalerz „Chemia organiczna” Wyd. Chemiczne 2002 5. A. Cygański „Metody elektroanalizy” WNT 1995</p>													
	eResources addresses	<p>CHEMIA dla Inżynierii Biomedycznej - Moodle ID: 17498  <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=17498">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=17498</a></p>													
Example issues/ example questions/ tasks being completed															
Work placement	Not applicable														

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