



## Subject card

Subject name and code	Basics of Chemistry, PG_00060833						
Field of study	Chemical Technology						
Date of commencement of studies	October 2023		Academic year of realisation of subject		2023/2024		
Education level	first-cycle studies		Subject group		Obligatory subject group in the field of study Subject group related to scientific research 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		5.0		
Learning profile	general academic profile		Assessment form		exam		
Conducting unit	Department of Inorganic Chemistry -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Rafał Grubba				
	Teachers		dr hab. inż. Łukasz Ponikiewski  dr inż. Andrzej Okuniewski  dr hab. inż. Rafał Grubba				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	15.0	0.0	0.0	0.0	45
	E-learning hours included: 0.0						
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	45		5.0		100.0	150
Subject objectives	A knowledge of principal concepts in general and inorganic chemistry.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_W02] has knowledge of inorganic, organic, physical and analytical chemistry useful for obtaining selected groups of compounds, determining their physical and chemical properties allowing for their quantitative and qualitative analysis, making measurements and determining the parameters of chemical reactions, phenomena and processes occurring in chemical technology		The student describes the structures electronic covalent chemical compounds using Lewis bonding theory and the octet rule. The student predicts the shape molecules of compounds covalent using VSEPR model. Student provides some properties compounds of group elements main ones based on the Lewis structure.		[SW1] Assessment of factual knowledge		
	[K6_K01] understands the need for continuing education, and is aware of the opportunities to improve professional, personal and social competences		He has a habit of constant education, and also understands the need to develop professional, personal, and social competences,		[SK1] Assessment of group work skills [SK5] Assessment of ability to solve problems that arise in practice		
	[K6_U03] is able to apply knowledge of inorganic, organic, physical and analytical chemistry and identify appropriate sources of information to design and synthesize simple chemical compounds, carry out basic physicochemical and analytical measurements		The student characterizes the elements chemical using periodic table. Student describes the electronic structure atom or ion according to the Pauli's law and Hund's rule. The student is able to design synthesis of simple compounds main group elements.		[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject		

Subject contents	<p>Lecture:</p> <p>Basic concepts and definitions: basic chemical laws, balanced chemical equations, ionic equations, nomenclature of chemical compounds. Redox reactions, oxidation number, reducing and oxidizing agents. Equations of state: ideal gas law, cubic and virial equations of state, Dalton's law of partial pressures, the kinetic theory of gases. Atomic structure: atomic nucleus, atomic and mass numbers, mass deficiency and nuclear energy, isotopes, nucleus stability, spontaneous disintegration of nuclei, radio decay rate, half-life period, thermonuclear reactions. Atomic structure: electrons in atoms, Bohr model, Heisenberg uncertainty principle, electron density, quantum numbers, atomic orbitals, Pauli exclusion principle, Hunds rule. Periodic table of elements: periodicity of chemical and physical properties of atoms, periods, groups and blocks of elements, atomic, ionic and van der Waals radii. Chemical bonds: valence electrons, octet rule, electronegativity, electron affinity, energies of chemical bonds, Molecular orbitals: LCAO (MO) method, sigma and pi orbitals, hybridization of atomic orbitals, hybridizations type and their geometric consequences. Lewis structures (diagrams), VSEPR Strong chemical bonds and their types, ionic, metallic and covalent bonds, physiochemical properties of molecular and ionic compounds, metals, alloys. Descriptive chemistry: hydrogen, oxygen and water. Weak interactions: hydrogen bonds, van der Waals forces. Solutions. Properties and functions of solvent, water as a solvent, solvation, autodissotiation of water, donor and acceptor solvents, melted salts. Electrolytes: weak and strong electrolytes, a the dissociation constant, the degree of ionization.</p> <p>Classes:</p> <p>Basic concepts and chemical laws. Ideal gas law. Composition stoichiometry. Formulas. Composition from formulas. Determination of a chemical formula, empirical (simplest) and molecular formulas. Composition of mixtures. Electrons configurations. Molecular orbitals - LCAO (MO) method. Lewis structures (diagrams), VSPER. Solutions expressing the concentration mass concentration, molar concentration, number concentration, volume concentration. Concentration conversion. Dilution and mixing of solutions Balacing equations (including redox equations). Reaction stoichiometry, excess and limiting reagent, parallel reactions, reaction yield. Reactions in solutions.</p>		
Prerequisites and co-requisites	The knowledge of chemistry at the level of secondary school is required.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written exam	60.0%	60.0%
	Written tests - three times during semester	60.0%	40.0%
Recommended reading	Basic literature	<ul style="list-style-type: none"><li>L. Jones, P. Atkins "Chemia ogólna"; PWN, 2004, or more recent issues (Polish translation from English "General Chemistry" original)</li><li>A. Bielański Podstawy chemii nieorganicznej (PWN) recent issues;</li><li>P.A. Cox Krótkie wykłady, chemia nieorganiczna, PWN, 2003; (Polish translation from English "Instant Notes in Inorganic Chemistry" original)</li></ul>	
	Supplementary literature	Materials available on the e-course website:  2023/2024 Podstawy chemii dla kierunków Technologia Chemiczna i Chemia semestr I - Moodle ID: 30877 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=30877">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=30877</a>	
	eResources addresses	Adresy na platformie eNauczanie: 2023/2024 Podstawy chemii dla kierunków Technologia Chemiczna i Chemia semestr I - Moodle ID: 30877 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=30877">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=30877</a>	
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"><li>1. Explain the concept of a mole. Sulfur forms crystals composed of eight-atom molecules. Calculate: a) how many atoms b) how many molecules c) how many moles of sulfur atoms d) how many moles of sulfur molecules contain 1 g of sulfur crystals.</li><li>2. What quantum numbers describe the orbital? State what values they can take and what information they provide.</li><li>3. Describe ionic and covalent bonding according to Lewis theory. Give two examples of compounds containing such a bond.</li></ol>		
Work placement	Not applicable		