



## Subject card

Subject name and code	Basics of Chemistry, PG_00069031						
Field of study	Chemical Technology						
Date of commencement of studies	October 2026	Academic year of realisation of subject			2026/2027		
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			4.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Department of Inorganic Chemistry -> Faculty of Chemistry -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Rafał Grubba					
	Teachers						
Lesson types	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		50.0	100
Subject objectives	The aim of the course is to introduce students to the fundamental concepts, laws, and principles of chemistry, including the structure of matter, types of chemical bonding, and chemical reactions. Students will develop the ability to describe and interpret chemical phenomena at the atomic and molecular levels. The course aims to enhance analytical thinking and the application of chemical knowledge to solve theoretical and practical problems.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_U03] Uses chemical knowledge to design compounds, perform physicochemical and analytical measurements, and obtain appropriate sources of information.	The student is able to determine the properties of chemical elements using the periodic table, describes the electron structure of atoms and ions according to the Pauli exclusion principle and Hund's rule, and design the synthesis of simple compounds of main-group elements.	[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject
	[K6_W02] Possesses the chemical knowledge necessary to synthesize, analyze and evaluate the properties of compounds and processes used in chemical technology.	The student has knowledge of the electronic structure of atoms and chemical compounds and understands how this structure affects the chemical and physical properties of elements and compounds. The student is familiar with Lewis theory, valence bond theory, and molecular orbital theory.	[SW1] Assessment of factual knowledge
[K6_K02] is aware of the responsibility for his/her work and is ready to work in a team and share responsibility for common tasks.	The student is able to collaborate within a team when solving calculation tasks, sharing duties and responsibility for the completion of tasks; the student is aware of their responsibility for the correctness and reliability of calculation results, the student demonstrates readiness to support team members in carrying out common tasks, while adhering to the principles of cooperation and communication; the student understands the need for a critical approach to their own work and the outcomes of teamwork.	[SK1] Assessment of group work skills [SK2] Assessment of progress of work [SK3] Assessment of ability to organize work [SK4] Assessment of communication skills, including language correctness	
Subject contents	Course content – lecture Lecture:		
	<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, Hund's 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, physicochemical 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, autodissociation of water, donor and acceptor solvents, melted salts. Electrolytes: weak and strong electrolytes, a the dissociation constant, the degree of ionization.</p>		
Prerequisites and co-requisites	Course content – exercises Classes:		
	<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), VSEPR. Solutions expressing the concentration mass concentration, molar concentration, number concentration, volume concentration. Concentration conversion. Dilution and mixing of solutions Balancing equations (including redox equations). Reaction stoichiometry, excess and limiting reagent, parallel reactions, reaction yield. Reactions in solutions.</p>		
Assessment methods and criteria	The knowledge of chemistry at the level of secondary school is required.		
	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written tests - three times during semester	60.0%	40.0%
Written exam	60.0%	60.0%	

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> </ul>
	Supplementary literature	<ul style="list-style-type: none"> <li>P.A. Cox Krótkie wykłady, chemia nieorganiczna, PWN, 2003; (Polish translation from English "Instant Notes in Inorganic Chemistry" original)</li> </ul>
	eResources addresses	
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>	
Practical activities within the subject	Not applicable	

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