GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Basics of Chemistry, PG_00069031		
Field of study	Podstawy chemii		
Date of commencement of studies	October 2025	Academic year of realisation of subject	2025/2026
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 -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Rafał Grubba	
	Teachers	dr inż. Kinga Kaniewska-Laskowska dr inż. Anna Ordyszewska-Lach dr hab. inż. Rafał Grubba	

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

eNauczanie source addresses:

Moodle ID: 1341 2025/26, Podstawy chemii, Technologia chemiczna i Chemia, I semestr
https://enauczanie.pg.edu.pl/2025/course/view.php?id=1341

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_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 calulation 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.	[SK4] Ocena umiejętności komunikacji, w tym poprawności językowej [SK3] Ocena umiejętności organizacji pracy [SK2] Ocena postępów pracy [SK1] Ocena umiejętności pracy w grupie
[K6_U03] Uses chemical knowledge to design compounds, perform physicochemical and analytical measurements, and obtain appropriate sources of information.	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.	[SU3] Ocena umiejętności wykorzystania wiedzy uzyskanej w ramach przedmiotu [SU2] Ocena umiejętności analizy informacji
[K6_W02] Possesses the chemical knowledge necessary to synthesize, analyze and evaluate the properties of compounds and processes used 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] Ocena wiedzy faktograficznej

Subject contents

Course content – lecture
Lecture:

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.

Course content – exercises
Classes:

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.

Prerequisites and co-requisites

The knowledge of chemistry at the level of secondary school is required.

<table>
<tr><td>Assessment methods and criteria</td><td colspan="2"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Written exam</td><td>60.0%</td><td>60.0%</td></tr>
<tr><td>Written tests - three times during semester</td><td>60.0%</td><td>40.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>• L. Jones, P. Atkins "Chemia ogólna"; PWN, 2004, or more recent issues (Polish translation from English "General Chemistry" original)
• A. Bielański Podstawy chemii nieorganicznej (PWN) recent issues;</td></tr>
<tr><td>Supplementary literature</td><td>• P.A. Cox Krótkie wykłady, chemia nieorganiczna, PWN, 2003; (Polish translation from English "Instant Notes in Inorganic Chemistry" original)</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">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.
2. What quantum numbers describe the orbital? State what values they can take and what information they provide.
3. Describe ionic and covalent bonding according to Lewis theory. Give two examples of compounds containing such a bond.</td></tr>
<tr><td>Practical activites within the subject</td><td colspan="2">Not applicable</td></tr>
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