GDAŃSK UNIVERSITY OF TECHNOLOGY

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

<table>
<tr><td>Subject contents</td><td>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.

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.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>The knowledge of chemistry at the level of secondary school is required.</td></tr>
<tr><td>Assessment methods and criteria</td><td>
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<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>
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<tr><td>Recommended reading</td><td>
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<tr><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;
• P.A. Cox Krótkie wykłady, chemia nieorganiczna, PWN, 2003; (Polish translation from English "Instant Notes in Inorganic Chemistry" original)</td></tr>
<tr><td>Supplementary literature</td><td>Materials available on the e-course website:

2023/2024 Podstawy chemii dla kierunków Technologia Chemiczna i Chemia semestr I - Moodle ID: 30877
https://enauczanie.pg.edu.pl/moodle/course/view.php?id=30877</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:
2023/2024 Podstawy chemii dla kierunków Technologia Chemiczna i Chemia semestr I - Moodle ID: 30877
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<tr><td>Example issues/ example questions/ tasks being completed</td><td>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>Work placement</td><td>Not applicable</td></tr>
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