GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Chemistry, PG_00037262		
Field of study	Technical Physics		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2024/2025
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	2	ECTS credits	4.0
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	dr hab. inż. Ewa Wagner-Wysiecka	
	Teachers		

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

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	35.0	100

Subject objectives

The main goal of the course is to consolidate knowledge of students in general chemistry.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U04] plans and conduct experiments, critically analyzes their results, draw conclusions and forms opinions, has laboratory work experience	The student has experience in working in a chemical laboratory	[SU4] Assessment of ability to use methods and tools

Subject contents

Periodic table of elements. Electron configurations of atoms. Periodic changes of some quantities: ionization energy of elements, electron affinity, electronegativity of elements. Atomic and ionic radius. Basic chemical laws, formulas and chemical equations. Chemical bonds: main types of bonds. Covalent bond: description of electrons in molecules considered on the basis of the electronic theory of chemical bonding and the theory of molecular orbital. Binding and anti-bonding orbitals. The shapes of the molecular orbital regions: molecular σ and π type orbitals. Electronic configuration of molecules. The concept of orbitals hybridization. Explanation of the shape of molecules based on the concept of hybridization. Delocalized bonds. Aromatic compounds: properties, examples. Explanation of the shape of molecules - VSEPR method. Polarization of chemical bonding. Intermolecular interactions. Hydrogen bonding and its effect on the physical properties of chemical compounds. General characteristics of the states of matter. Solid: crystallographic systems, elementary cell types, ionic, covalent, molecular and metallic crystals. The crystal structure and the physical properties of the substance. Types of chemical reactions. Nomenclature of inorganic compounds. Properties of particular groups of inorganic compounds. Coordination binding. Complex compounds: the concept of a central atom and ligand, examples of complex compounds and their names, properties of complex compounds and their importance. Complex compounds - the theory of the crystalline field. Organic compounds: classification, nomenclature, isomerism, properties, reactivity. Mechanisms of reaction of organic compounds. Aromatic electrophilic substitution. Polymer synthesis methods. The structure of the polymer and its properties. Biologically important macromolecules: the structure of proteins and nucleic acids. Chemical thermodynamics - basic concepts, the first principle. Enthalpy of physical changes and chemical reactions. The second law of thermodynamics: entropy, free enthalpy, free enthalpy of reaction, spontaneous processes, reactions in a state of equilibrium. Solutions, types of solutions. Chemical equilibrium. Balance in aqueous solutions. Electrolyte solutions. Ion and proton theory of acids and bases. The concept of pH. Low electrolytes. Hydrolysis. Ostwald's dilution law. Buffer solutions. Electronic theory of acids and bases, HSAB theory. Strong electrolytes, the concept of ionic activity and strength. Chemical kinetics. Effect of concentrations of reacting substances on the reaction rate. The influence of temperature. The role of the catalyst. Chemical qualitative and quantitative analysis. Oxidation and reduction reactions. Oxidation state. Cell. Electrode potential. The Nernst pattern. Half cell. Definition of relative electrode potential. Half-cell of the first type. A series of electrochemical metals. Half-cell of the second type. Redox half-cell. Membrane electrodes. Electrolysis.

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<tr><td>Prerequisites and co-requisites</td><td colspan="3"></td></tr>
<tr><td>Assessment methods and criteria</td><td colspan="3"><table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>Passing laboratory exercises</td><td>50.0%</td><td>50.0%</td></tr><tr><td>Passing the lecture</td><td>50.0%</td><td>50.0%</td></tr></table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">1. L. Jones, P. Atkins „Chemia ogólna. Czasteczki, 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. P.W. Atkins „Podstawy chemii fizycznej” PWN 1999. 5. J. McMurry „Chemia organiczna” PWN 2005. 6. E. Luboch, M. Bocheńska, J.F. Biernat (red.) „Chemia ogólna. Ćwiczenia laboratoryjne”, Wyd. PG 2003.</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">1. W. Kołos, J. Sadlej „Atom i cząsteczka” WNT 2007. 2. P.W. Atkins „Przewodnik po chemii fizycznej” PWN 1997. 3. A. Cygański „Metody elektroanalityczne” WNT 1995.</td></tr>
<tr><td>eResources addresses</td><td colspan="2">Adresy na platformie eNauczanie:</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3"></td></tr>
<tr><td>Work placement</td><td colspan="3">Not applicable</td></tr>
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