GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	BASIC OF CHEMISTRY, PG_00053076		
Field of study	Chemistry		
Date of commencement of studies	October 2021	Academic year of realisation of subject	2021/2022
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. Łukasz Ponikiewski	
	Teachers	dr hab. inż. Łukasz Ponikiewski dr inż. Daria Kowalkowska-Zedler dr inż. Andrzej Okuniewski	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	30.0	0.0	0.0	0.0	60

E-learning hours included: 0.0

Podstawy Chemii _kierunek_Chemia_2021/2022 - Moodle ID: 17602
https://enauczanie.pg.edu.pl/moodle/course/view.php?id=17602

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	10.0	55.0	125

Subject objectives

Mastery of basic notions of general chemistry and periodic table.

Learning outcomes

Course outcome	Subject outcome	Method of verification
K6_W02	The student characterize chemical elements using a periodic system. The student describes the electronic structure of an atom or ion in accordance with the Pauli exclusion principle and Hund's rule. The student explains the basic thermochemical definitions and performs calculations based on Hess's law. The student knows the criteria for spontaneous change. The student knows the definition of reaction rate. The student can describe reversible reactions.	[SW1] Assessment of factual knowledge
K6_W03	Students acquires knowledge concernig electronic structures of covalent compounds applying Lewis structures and octet rule. Students predict shapes of covalent molecules using VSEPR model. Student predicts some properties of compounds of elements of main groups based on the Lewis structure.	[SW1] Assessment of factual knowledge

Subject contents

Lecture:

1. Atoms and molecules. Masses and sizes of atoms. Chemical element, isotope, atomic number and mass number. the mole, Avogadro number.
2. States of matter and their properties.
3. The structure of an atom. Radioactivity. Subatomic particles.
4. Electronic structure of atoms. de Broigle equation, Heisenberg uncertainty principle, qualitative description of an atom according to Schrödinger theory. Quantum numbers, orbitals, Pauli exclusion principle and Hund's rule. Valence electrons. Electronic configuration for atoms and ions.
5. Trends in the periodic table of the elements
6. Chemical reactions, their types and their energetic effects. Reaction rate. Reversible reactions.
7. Chemical bonding. Classification of chemical bonds. Hybridisation of orbitals, Lewis structures of covalent compounds. Geometry of molecules or ions based on VSEPR concept. Molecular orbitals and LCAO method for diatomic homonuclear compounds of 2nd row elements. The bond order. Intermolecular interactions.
8. Classification of inorganic chemical compounds: hydrides, oxides, acids, bases, salts. Amfoteric properties.
9. Properties of hydrogen, oxygen, ozone, water and hydrogen peroxide. Allotropy and isomorphism.
10. Properties of solutions. Hardness of water.

Seminars:
1. Basic laws and principles in chemistry
2. Quantitative aspects of metter (mole). Calculations based on the mole concept.
3. Gas laws
4. Lewis structures for molecules and ions.
5. Formulas from composition percentage
6. Determination of chemical formulas based on analytical results
7. Balancing of chemical reactions especially redox reactions.
8. Calculation of mass, volume, number of moles of products based on the equation of chemical reaction. Yield calculation.
9. Chemical equivalent for different types of chemical reactions. Application of this term to stoichiometric calculations
10. Solutions, percentage concentration, molar concentration, ppm, ppb.

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
Lecture - final exam	60.0%	67.0%
Passing the exercises	60.0%	33.0%

Recommended reading

Basic literature	1. L. Jones, P. Atkins. Chemia Ogólna. Wydawnictwo Naukowe PWN, Warszawa 2004. 2. K.M. Pazdro. Podstawy Chemii dla kandydatów na wyższe uczelnie.
Supplementary literature	A. Bielański. Podstawy Chemii Nieorganicznej. Wydawnictwo Naukowe PWN, Warszawa 2007.
eResources addresses	

Example issues/ example questions/ tasks being completed	**1.** Define the Avogadro's number. Calculate how many methane molecules contains 1000 m^3 of this gas under normal conditions. Calculate the mass (kg) of this volume of methane. **2.** Please define the mass number and the atomic number. How many protons, neutrons and electrons contains: a) $^{96}_{44}Ru$ b) $^{104}_{44}Ru$ c) $^{96}_{44}Ru^{2+}$ d) $^{96}_{44}Ru^{2-}$ **3.** Complete the following combustion equations: a) $Mg + O_2 =$ b) $K + O_2 =$ c) $Na + O_2 =$ d) $Li + O_2 =$ **4.** Write the Lewis formula of ionic potassium sulfide. **5.** Indicate the valence electrons for Pb, Pb^{2+}, Pb^{4+} and for Au, Au^{+} and Au^{3+}. **6.** Describe detailed the industrial methods of hydrogen production. Write the adequate chemical equations. **7.** Using the molecular orbital energy diagram explain the configuration of valence electrons in O_2^{-}. Calculate the bond order in this anion. **8.** Draw the Lewis structures and describe the shapes of molecules (ions) for: SO_3^{2-}, SF_4, BeF_3^{-}, HCO_3^{-}. **9**. Complete the following chemical equations: a) $Al + NaOH + H_2O \rightarrow$ b) $KH + H_2O \rightarrow$ c) $Mg + H_2O \rightarrow$ **10**. Please discuss the Gay-Lussac law off combining volumes. we combust 2 dm^3 of ethene C_2H_4. The product of this combustion is carbon monooxide and water. Calculate the volume of used oxygen. **11**. Discuss the Hund's rule. Estimate the electron configuration for cation Fe^{3+}.
Work placement	Not applicable