University of Gdańsk

Subject card

Subject name and code	Inorganic Chemistry, PG_00188275		
Field of study	Chemia nieorganiczna (Ćw.laboratoryjne)		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2026/2027
Education level	Bachelor's 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 polish
Semester of study	2	ECTS credits	2.0
Learning profile	academic	Assessment form	credit
Conducting unit	Laboratory of Physicochemistry of Coordination Complexes -> Department of General and Inorganic Chemistry -> Faculty of Chemistry -> Rector		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Dariusz Wyrzykowski	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	0.0	0.0	30.0	0.0	0.0	30

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	30	5.0	15.0	50

Subject objectives

consolidation of basic theoretical knowledge in the field of inorganic chemistry introduction to important problems of contemporary inorganic chemistry presentation of the most important contemporary issues in inorganic chemistry that constitute progress in this field developing the ability to independently experiment and interpret the obtained results and solve problems when conducting chemical experiments

Learning outcomes

Course outcome	Subject outcome	Method of verification
[AKRL3_K06] The graduate is ready to follow occupational health and safety regulations in the laboratory and care for the safety of themselves and others.	improves their professional and personal skills by using information provided in various sources	[SK8] obserwacja samodzielnej lub zespołowej pracy studenta
[AKRL3_U01] The graduate is able to identify, analyse and solve complex research problems in chemistry and forensic science by selecting appropriate methods and information sources.	identifies, analyzes, and solves problems in the broad field of chemistry based on acquired knowledge	[SU6] demonstracja umiejętności praktycznych
[AKRL3_W02] The graduate knows and understands, at an advanced level, the analytical methods used in forensic laboratories, in particular spectroscopic, chromatographic and electroanalytical methods.	describes in detail the properties of elements and the most important chemical compounds, lists the methods of obtaining them and the methods of analysis	[SW1] wypowiedź ustna/rozmowa/ dyskusja [SW2] prezentacja/projekt/referat/ raport [SW3] opracowanie tekstowe/ praca pisemna
[AKRL3_U02] The graduate can plan and organize individual and team work and collaborate with others in team projects (including interdisciplinary teams).	performs analyses using experimental methods and formulates conclusions based on them	[SU6] demonstracja umiejętności praktycznych
[AKRL3_K01] The graduate is ready to critically evaluate their own knowledge, understand its importance for solving cognitive and practical problems, and to seek expert opinions when necessary.	identifies the level of their knowledge and skills, the need for continuous training and personal development	[SK6] demonstracja umiejętności praktycznych [SK8] obserwacja samodzielnej lub zespołowej pracy studenta
[AKRL3_U11] The graduate is able to work effectively in a laboratory team while adhering to professional ethics and organisational rules.	prepares and presents oral presentations on various topics in chemistry in Polish and English, using acquired knowledge and skills as well as basic sources of scientific information	[SU6] demonstracja umiejętności praktycznych [SU8] obserwacja samodzielnej lub zespołowej pracy studenta

Subject contents

Topics of the lecture: periodicity and the chemistry of the elements, physicochemical properties of inorganic and coordination compounds. The following items are included: periodicity, chemical bonding, coordination compounds, types of chemical reactions, properties of chemical elements and their compounds. The groups of elements are presented in the following order: group 1, group 2, group 13, group14, group 15, group 16, group 17, group 18, and d-elements (groups 3-12; first transition row, second transition row, and third transition row).

Topics of auditory classes: basic types of inorganic compounds, valence bond theory, hybridization and molecular geometry; molecular orbital theory; solid state bonds: ionic, covalent, metallic; metals, semiconductors and insulator; coordination compounds.

Topics of lab classes: investigation of physicochemical properties of the elements, inorganic and coordination compounds based on chemical experiments.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
test - oral or written presentation/ project/paper/report	51.0%	100.0%

Recommended reading

Basic literature	A. Bielański Podstawy chemii nieorganicznej, PWN 2002 J. D. Lee Zwięzła chemia nieorganiczna, PWN 1997 L. Jones, P. Atkins Chemia ogólna, PWN 2004 B. Literatura uzupełniająca
Supplementary literature	L. Pajdowski Chemia ogólna, PWN 1999
eResources addresses	

Example issues/ example questions/ tasks being completed	**Task 1. (0.25 pts per equation)** Complete and balance the following chemical reaction equations: a) Na + NH b) KO + HO c) CaH + PbSO d) BaO + HSO **Task 2. (1 pt)** Boron does not occur in nature in its free state. Its primary source is borax (NaBO·10HO). Outline the process for obtaining elemental boron from borax, including all necessary reaction equations. **Task 3. (1 pt)** Which of the following compounds is paramagnetic: BaO or KO? Justify your answer by referring to the electronic structure of peroxide and superoxide ions. **Task 4. (1 pt)** Describe the industrial method for producing nitric(V) acid (nitric acid). The description should include the raw materials and key chemical reactions. **Task 5. (1 pt)** Discuss the redox properties of hydrogen peroxide by writing one reaction equation for each of the following cases, illustrating its role as: a) an oxidizing agent in an acidic environment, b) a reducing agent in an acidic environment, c) an oxidizing agent in a basic environment, d) a reducing agent in a basic environment. **Task 6. (1 pt)**

Although carbon is only the 14th most abundant element in the Earth's crust, the number of its compounds far exceeds the number of compounds of all other elements. Explain this phenomenon by referring to the unique properties of the carbon atom.

Task 7. (1 pt)

Using semi-structural (group) formulas, write the reaction equations leading to the formation of hexamethyldisiloxane from dichlorodimethylsilane, via an intermediate step involving trimethylchlorosilane.

Task 8. (1 pt)

Metallic silver is obtained through a cyanidation process, which involves leaching the ore with a potassium cyanide solution in the presence of oxygen, followed by the reduction of the resulting complex with zinc. Based on this description:

a) write the equations for the dissolution of silver and its recovery,

b) give the systematic names for all products containing metal ions.

Task 9. (1 pt)

A sodium hydroxide solution was added to an aqueous solution of mercury(II) nitrate. The resulting precipitate was isolated and divided into three parts. Two parts were treated with concentrated hydrochloric acid and concentrated sodium hydroxide, respectively.

Record the observations and write the reaction equations for the processes occurring in each of the described test tubes.

Task 10. (1 pt)

For the following sequence of chromium transformations:

Cr CrCl CrCl KCrO KCrO

a) write the ionic reaction equations (in short form),

b) state the color change of the solution accompanying each transformation.

Task 11. (1 pt)

Noble gases (except for He and Rn) are obtained by the fractional distillation of liquefied air, after the prior removal of oxygen and nitrogen. Propose and describe methods for removing oxygen and nitrogen from air before its liquefaction, writing the appropriate reaction equations.

Work placement	Not applicable

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