



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Chemia ogólna i nieorganiczna (General and inorganic chemistry)

### Course

Field of study

Year/Semester

Technologia chemiczna (Chemical Technology)

I/2

Area of study (specialization)

Profile of study

-

general academic

Level of study

Course offered in

First-cycle studies

Polish

Form of study

Requirements

full-time

compulsory

### Number of hours

Lecture

Laboratory classes

Other (e.g. online)

0

60

0

Tutorials

Projects/seminars

0

0

### Number of credit points

5

### Lecturers

Responsible for the course/lecturer:

dr hab. inż. Bogdan Wyrwas

Responsible for the course/lecturer:

dr inż. Andrzej Szymański

### Prerequisites

Student: has knowledge resulting from passing the course of General and Inorganic Chemistry in the first semester, in particular:

W1) Has extended knowledge regarding the structure of matter; identifies the components of matter and characterizes the interactions between them; knows the structure of atoms and the genesis of their creation; defines and explains the laws governing the interaction of matter components at both the nuclear and atomic levels

W2) Indicates the properties of elements resulting from the electronic configuration of their atoms and their position in the periodic table and, in particular, knows and explains the relationship between the electronic configuration of atoms and the reactivity of elements

W3) Lists reactions involving inorganic compounds of great practical industrial importance. Describes, explains and characterizes their chemistry (course and associated effects)

Student: has the skills resulting from passing the course of General and Inorganic Chemistry in the first semester, in particular:



U1) Analyzes and interprets the content of calculation tasks and performs chemical calculations (mainly in the field of concentration conversion, stoichiometry and basics of thermodynamics of chemical reactions)

U2) Uses the periodic table of elements and is able to use it as a basic source of information about the physicochemical properties of elements and their compounds

U3) Uses the current nomenclature of inorganic compounds and, in particular, is able to combine the correct name of the compound with its correct summary (stoichiometric) formula, which can correctly write and, on this basis, prepare its structural formula

U4) Writes and correctly balances chemical reactions between inorganic reagents (also with the participation of simple organic compounds); predicts the direction of chemical reactions of any type (including oxidation and reduction reactions) and characterizes quantitatively steady state of the reaction (can calculate the equilibrium constant of a chemical reaction)

W4) Lists and describes the most important harmful effects of some elements and inorganic compounds on the environment, and identifies the main sources from which they are emitted to the environment

K1) Is aware of the continuous, rapid increase of knowledge in the field of inorganic chemistry, and on this basis - the level of his knowledge in this field, which causes him a determination and an active attitude in further study and assimilation of new knowledge on his own initiative

K2) Is aware that knowledge regarding inorganic chemistry is widely used in industry and the economy; understands in this connection and reckons with the necessity of practical use of acquired knowledge and skills in the future; is aware of the responsibility associated with this

### Course objective

Enhancing knowledge regarding general and inorganic chemistry and expanding it with knowledge and practical skills related to work in a chemical laboratory. Introduction of the principles of safe work in the laboratory. Introduction of the organization of laboratory work and the basic techniques used in laboratory work. Teaching the correct interpretation of test results

### Course-related learning outcomes

#### Knowledge

1. Has solid theoretical knowledge in the field of inorganic and general chemistry and, in particular, describes the structure of matter at the nuclear, atomic and molecular level; identifies the properties of elements and their compounds, explaining them in connection with the place of the element in the periodic table

K\_W03, K\_W08

2. Knows the principles of health and safety at work in a chemical laboratory and, in particular, the principle of maintaining order in the workplace; knows the basic principles of first aid in the event of accidents and incidents



K\_W018

3. Lists and characterizes the basic techniques of laboratory work

K\_W15

4. Knows how to plan and carry out a simple chemical experiment and how to analyze, develop and describe its results

Skills

1. Has well-established skills in the field of chemical calculations, using the periodic table of elements, notation of summary and structural formulas of chemical compounds as well as writing and balancing of any type of chemical reactions involving inorganic compounds

K\_U01, K\_U18

2. Is able to analyze and solve typical chemical problems based on knowledge from various sources, including knowledge sought independently; knows how to compare knowledge from different sources

K\_U01, K\_U16

3. Can organize his own work in a chemical laboratory; correctly applies laboratory work techniques; correctly uses laboratory equipment and correctly interprets the results obtained

K\_U01, K\_U07, K\_U20

4. Practically implements the principles of safe work in a chemical laboratory

K\_U10, K\_U28

Social competences

1. Perceives the relationship between own safety as well as the safety of others working in a chemical laboratory and the compliance with the regulations which apply in a chemical laboratory; develops a habit of maintaining order in the workplace

K\_K03

2. Is aware of the threat to the natural environment from some commonly used, inorganic chemical compounds; understands the need for action to minimize these harmful effects

K\_K02, K\_K07

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The teacher regularly controls the theoretical preparation of students to perform planned exercises. The check is carried out by polling and / or in the form of written tests. The teacher observes and assesses the behavior of students in the laboratory, including the ability to organize laboratory work and their



manual skills during the performance of the exercises planned. Written reports on performed exercises are subject to evaluation. The final grade is the result of the three components listed above.

### Programme content

Laboratory:

1. pH scale
2. Acid-base reactions
3. Reaction of aqueous solutions of salts
4. Buffer solutions
5. Complexing reactions I (gradual complex formation, buffer solution of the complex compound)
6. Complexing reactions II (properties of complex compounds: complexes and acidity, stability of complex compounds)
7. Oxidation and reduction reactions I (reduction with metals, hydrogen ion as an oxidant, power of oxidants and reducers, the effect of temperature on the redox reaction)
8. Oxidation and reduction reactions II (effect of pH on redox reactions, disproportionation reactions)
9. Separation by precipitation
10. Separation by extraction
11. Validation of automatic pipettes
12. Qualitative analysis of cations (according to the division of Fresenius into five analytical groups)
13. Qualitative analysis of anions (according to the division of Aleksiejew into three analytical groups)
14. Qualitative analysis of salts

### Teaching methods

Classes are practical, they consist in the students themselves doing exercises included in the course plan. Exercises are performed in accordance with the attached instructions. The teacher personally shows and explains how to perform the activities and operations that students meet for the first time. The teacher constantly controls the student's behavior in the laboratory and the way of performing his work themselves. He immediately notices and corrects irregularities.

### Bibliography

Basic

1. J. Minczewski, Z. Marczenko Chemia analityczna t. I PWN Warszawa 1976



2. G. Charlot, Analiza nieorganiczna jakościowa, PWN, Warszawa 1976
3. A. Bielański, Podstawy chemii nieorganicznej, t.1-3, PWN, Warszawa 2012
4. L. Jones, P. Atkins, Chemia ogólna. Częsteczki, materia, reakcje, tom 1 i 2, PWN, Warszawa 2009
5. J.D. Lee, Zwięzła chemia nieorganiczna, PWN, Warszawa 1999
6. F. Domka, J. Jasiczak, Analiza jakościowa, Wydawnictwo AE, Poznań 2004
7. K. M. Pazdro, Zbiór zadań z chemii, Oficyna Edukacyjna 2007
8. L. Pajdowski, Chemia ogólna, PWN, Warszawa 1992

#### Additional

1. A. Ciszewski, M. Baraniak, Aktywność chemiczna i elektrochemiczna pierwiastków w środowisku wody, Wydawnictwo PP, Poznań 2006
3. B. Chmielewska-Bojarska, Chemia analityczna. Analiza jakościowa kationów i anionów, Wydawnictwo Uniwersytetu Łódzkiego 2012
3. W. N. Aleksiejew, Analiza jakościowa, PWN, Warszawa 1968
4. F.A. Cotton, G. Wilkinson, C. Murillo, M. Bochmann, Chemia nieorganiczna. Podstawy, PWN, Warszawa 1995
5. L. Kolditz, Chemia nieorganiczna, PWN, Warszawa 1994
6. M.J. Sienko, R.A. Plane, Chemia. Podstawy i zastosowania, WNT, Warszawa 2002
7. W. Ufnalski, Podstawy obliczeń chemicznych z programami komputerowymi, WNT, W-wa 1999
8. G.W. van Loon, S. J. Duffy, Chemia środowiska, PWN, Warszawa 2008

#### Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,0
Classes requiring direct contact with the teacher	70	2,8
Student's own work (literature studies, preparation for laboratory classes, preparation for tests, preparation of laboratory reports) <sup>1</sup>	55	2,2

<sup>1</sup> delete or add other activities as appropriate