COURSE DESCRIPTION CARD - SYLLABUS

Course name
General and inorganic chemistry [S1TOZ1>COiN2]

Course

Field of study
Circular System Technologies

Year/Semester
1/2

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
0

Laboratory classes
45

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

3,00

Coordinators

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Prerequisites

The student has the knowledge, skills and social competences resulting from passing the General and Inorganic Chemistry course in the first semester of studies (passing the exercises with a positive grade and the lecture with a positive exam grade), in particular: Knowledge: 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) Skills: 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) U5) 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 Social competences: 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. the student 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. the student 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. the student 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:

Learning outcomes presented above are verified as follows:
Laboratory: the teacher regularly controls the theoretical preparation of students for the implementation of the laboratory exercise plan. The check is carried out by oral questioning 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 manual skills during the performance of the exercises planned. Written reports on performed exercises are subject to evaluation. The final grade from laboratory classes is the outcome of the above three components - it is evaluated according to the scale of grades in force at Poznan University of Technology. If the classes are conducted remotely, then as part of the report, the tutor gives students additional problems for solving, relating to the issues of laboratory practice, assessing the manner of their description and interpretation.

Programme content

Laboratory classes cover the following topics:
1. pH scale
2. Acid-base reactions
3. Reaction of quaoues 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. Verification of the accuracy of laboratory pipettes
12. Qualitative analysis of cations (division of cations according to Fresenius into five analytical groups; practically students perform characteristic reactions and then analysis of selected cations: Cu2+, Al3+, Ni2+, Zn2+, Mn2+, Fe3+, Cr3+, Ca2+, Sr2+, Ba2+, Mg2+, K+, NH4+)
13. Qualitative analysis of anions (division of anions according to Alexeyev into three analytical groups; practically students perform characteristic reactions and then analysis of selected anions: SO42-, PO43-, CO32-, C2O42-, S2O32-, F-, Cl-, I-, SCN-, NO2-, NO3-, CH3COO-)

Teaching methods

Laboratory: 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. Students are required to keep notes on the basis of which they prepare reports on laboratory exercises. In the case of conducting laboratory classes remotely, it is of particular importance to present students" videos on the issues of laboratory practice and discuss them in detail.

Bibliography

Basic
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Additional
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Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	50	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	25	1,00