COURSE DESCRIPTION CARD - SYLLABUS

Course name
General and inorganic chemistry [S1IFar2>COiN2]

Course

Field of study
Pharmaceutical Engineering

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
0

Tutorials
0

Projects/seminars
0

Number of credit points

3,00

Coordinators

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Lecturers

Prerequisites

Knowledge: the student has the knowledge resulting from passing the course of General and Inorganic Chemistry in the first semester, in particular: 1. Student 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 2. 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 3. 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 4. Lists and characterizes the basic techniques of laboratory work 5. Knows how to plan and carry out a simple chemical experiment and how to analyze, develop and describe its results Skills: the student has the skills resulting from passing the course of General and Inorganic Chemistry in the first semester, in particular: 1. Student analyzes and interprets the content of computational tasks and performs chemical calculations (mainly in the field of concentration conversion, stoichiometry and basics of thermodynamics of chemical reactions) 2. 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 3. Uses the current nomenclature of inorganic compounds and is especially 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 4. Writes and correctly balances chemical reactions between inorganic reagents (also with the participation of simple organic compounds); predicts the direction of any type of chemical reactions (including oxidation and reduction reactions) and is able to quantify the steady state of the reaction (can calculate the equilibrium constant of a chemical reaction) 5. Can organize his own work in a chemical laboratory; correctly applies laboratory work techniques; correctly uses laboratory equipment and correctly interprets the results obtained; practically implements the principles of safe work in a chemical laboratory Social competences: The student has the social competences resulting from passing the course of General and Inorganic Chemistry in the first semester, in particular: 1. The student is aware of the continuous, rapid increase in knowledge in the field of inorganic chemistry and, as a result - the level of his knowledge in this field, which causes him to further study and assimilate new knowledge on his own initiative, with determination and an active attitude 2. Is aware that knowledge regarding inorganic chemistry is widely used in industry and the economy; understands 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

The arrangement of knowledge in the field of general and inorganic chemistry and expanding it with knowledge about the production, properties and applications of inorganic construction materials, and with knowledge and practical skills related to work in a chemical laboratory. Acquaintaning with the principles of safe work in the laboratory. Acquaintaning with the organization of laboratory work and the basic techniques of work used in the chemical laboratory. Teaching the correct interpretation of the experimental 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_W3, K_W4]
2. Lists and characterizes inorganic construction materials from the point of view of their applications, physicochemical properties and production technology. [K_W1, K_W4]
3. Has established theoretical knowledge and laboratory practice in the field of qualitative analysis of cations and anions and salt identification. [K_W4]
4. 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_W27]

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_U2, K_U3]
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_U1, K_U10]
3. Has the ability to organize own work in a chemical laboratory; correctly uses typical techniques of laboratory work; correctly uses laboratory equipment and correctly interprets the obtained results. [K_U11, K_U12]
4. Is able, based on his own knowledge, to select the appropriate inorganic substance with pharmacological action or a potential inorganic raw material for the pharmaceutical industry, knowing the physicochemical and pharmacological conditions. [K_U1, K_U2]
5. Practically implements the principles of safe work in a chemical laboratory. [K_U22]

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_K2, K_K4]
2. Is aware of the dangers to the natural environment and people posed by certain technologies used in

the pharmaceutical industry; understands the need to act to minimize these harmful effects. [K_K2, K_K3]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: the final test is done in a form of a stationary or remote test (depending on the method of conducting classes). The test may contain approximately 50 questions, open and closed. The threshold of pass the test: 50% of the total points. Based on the number of points obtained, the final grade is issued, according to the rating scale in force at Poznan University of Technology.
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

Lecture:
1. General systematics of chemical properties of elements and their compounds. General characteristics of the s-, p-, d- and f-electron chemical elements. Non-metals and their relationships. Hydrogen. Oxygen. Chlorine and halogens. Sulfur. Nitrogen. Phosphorus. Silicates. Aluminosilicates - raw materials for the production of ceramics. Metals. Oxides, hydroxides and sulphides of metals. Overview of potential-pH graphs for metals. Methods of obtaining the most important metals. Organometallic compounds. Applications of the main inorganic compounds
2. Review of inorganic compounds with pharmacological properties and potential inorganic raw materials for the pharmaceutical industry. Linking the characteristic properties of these compounds with their potential applications.
3. Qualitative inorganic analysis. Division of anions and cations into analytical groups - effects of reactions with group reagents. Review of the characteristic reactions of the most important cations and anions (mainly in terms of the observed effects).
4. Theoretical basis of physicochemical identification of chemical compounds with focus on inorganic compounds (salts).
Laboratory:
1. Qualitative analysis of cations (division of cations according to Fresenius into five analytical groups; practically, students perform characteristic reactions and then analyse unknown cations individually and in a mixture)
2. Qualitative analysis of anions (division of anions according to Alexeyev into three analytical groups; practically, students perform characteristic reactions and then analyse unknown anions individually and in a mixture)
3. Physicochemical identification of salt:
- basic physicochemical tests (heating of the salt; dissolving salt in acids, alkalis, and water; obtaining borax and phosphate pearls; melting of the salt)
- analysis of the cation and anion included in the salt

Course topics

none

Teaching methods

Lecture: based on multimedia presentations containing relevant examples; as a complement, additional examples with explanations, resulting from the current interest of the students.
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