

LEARNING MODULE DESCRIPTION (SYLLABUS)

INORGANIC CHEMISTRY

I. General information

1. Module title:
Inorganic Chemistry
2. Module code:
INOCHEM
3. Module type:
compulsory
4. Programme title:
Chemistry
5. Cycle of studies:
second cycle of studies
6. Year of studies:
First year
7. Terms in which taught:
First - winter
8. Type of classes and the number of contact hours **Lectures: 15 hours; laboratory: 45 hours**
9. Number of ECTS credits:
5
10. Name, surname, academic degree/title of the module lecturer/other teaching staff/ e-mail
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11. Language of classes:
English

II. Detailed information

1. Course description: Study of advanced principles of inorganic chemistry including atomic structure, symmetry, advanced bonding theories, acid and bases, coordination chemistry, metallo-supramolecular chemistry, organometallic chemistry and bioinorganic chemistry.
2. Course objectives:
 - Describe and identify acids and bases under various definitions.
 - Compare the relative strengths of acids and bases in aqueous and non-aqueous solvents.
 - Describe bonding models for coordination compounds.
 - Recognize isomerism and geometries in coordination compounds.
 - Predict and explain the magnetic and spectroscopic properties of coordination compounds
 - Describe the kinetics and mechanisms of reactions of coordination compounds.
 - Describe the role of metal ions in biological systems.
 - Describe the chemistry of metallo-supramolecular structures, their topologies and properties.
 - Recognize the practical aspects and applications of inorganic structures and materials.
 - Work and communicate in a group.
 - Prepare laboratory reports and use literature sources.

- Work safely in laboratory of inorganic chemistry.
3. Pre-requisites in terms of knowledge, skills and social competences (where relevant)
Advanced knowledge of inorganic chemistry and applied it in experiments - inorganic and coordination synthesis.
 4. Module learning outcomes in terms of knowledge, skills and social competences and their reference to programme learning outcomes

Learning outcomes symbol*	Upon completion of the course, students will:	Reference to programme learning outcomes#
INOCHE_01	know the synthetic principles of generating elements, coordination compounds and complex inorganic architectures	CHE2_W01; CHE2_W02, CHE2_W05; CHE2_W08, CHE2_U04
INOCHE_02	know how to correctly write names, formulas chemical compounds	CHE2_W01, CHE2_W02, CHE2_U01
INOCHE_03	Understand the rules of naming and writing structures of inorganic architectures	CHE2_W02, CHE2_W04, CHE2_U01
INOCHE_04	know properties and application of elements from block s, p, d, f and complex inorganic structures	CHE2_W01; CHE2_W02, CHE2_W05
INOCHE_05	have a knowledge about inorganic catalysis	CHE2_W03; CHE2_W05; CHE2_W07; CHE2_W08
INOCHE_06	be able to apply the appropriate analytical techniques for the identification and characterization of inorganic compounds (NMR, ESI-MS, UV-vis, X-ray)	CHE2_W01, CHE2_W04, CHE2_W07, CHE2_U02, CHE2_U06, CHE2_U08, CHE2_U12, CHE2_U13, CHE2_U14 CHE2_K01, CHE2_K02
INOCHE_07	be able to use literature sources	CHE2_W01, CHE2_W08, CHE2_U09, CHE2_U10, CHE2_U11, CHE2_U13
INOCHE_08	be able to plan experimental work according to timeframe given and look after tidiness and safety of working area	CHE2_W01, CHE2_W07, CHE2_U08; CHE2_U11, CHE2_U15
INOCHE_09	be able to conduct and control the experimental work according to the given procedure	CHE2_U03; CHE2_U04; CHE2_U08
INOCHE_10	be able to prepare a written report concerning the conducted experiment, properties and activity of metal complexes	CHE2_W01, CHE2_W02, CHE2_W03, CHE2_W04, CHE2_U02, CHE2_U03, CHE2_U06, CHE2_U08, CHE2_U09, CHE2_U10, CHE2_U12, CHE2_U13, CHE2_U14 CHE2_K01, CHE2_K02
INOCHE_11	be able to evaluate the work contribution of themselves and other group members	CHE2_U08, CHE2_U09, CHE2_U10, CHE2_U11, CHE2_U14, CHE2_U15, CHE2_K04
INOCHE_12	be able apply safety rules in the laboratory of inorganic chemistry	CHE2_W07, CHE2_U15, CHE2_K03, CHE2_K04

* module code,

programme learning outcomes

01, 02... - learning outcome number

4. Learning content

Learning content symbol	Learning content description	Reference to module learning outcomes
TK_01	safety rules of work in laboratory of inorganic chemistry	INOCHE_8, INOCHE_9, INOCHE_12
TK_02	occurrence, isolation and preparation methods of chemical elements	INOCHE_1, INOCHE_2
TK_03	chemistry of transition metal and their complexes	INOCHE_1, INOCHE_2
TK_04	coordination and metallo-supramolecular chemistry	INOCHE_3, INOCHE_4
TK_05	structure and properties of coordination complexes, complexes with π-acceptor and π-donor ligands	INOCHE_2, INOCHE_3, INOCHE_6, INOCHE_7
TK_06	inorganic catalysis	INOCHE_3, INOCHE_5
TK_07	application of inorganic catalysis in chemical industry	INOCHE_5, INOCHE_7
TK_08	importance of inorganic chemistry in biological systems	INOCHE_1, INOCHE_4
TK_09	materials with specific physico-chemical properties	INOCHE_4, INOCHE_6
TK_10	application of inorganic compounds and materials in the industry	INOCHE_1, INOCHE_5
TK_11	data analysis of the obtained products	INOCHE_10, INOCHE_11

5. Reading list

- F A Cotton, G Wilkinson, C A. Murillo and M. Bochmann, "Advanced Inorganic Chemistry", 6th edition, Wiley, 1999
- C. E. Housecroft and A. G. Sharpe, "Inorganic Chemistry", 3rd Edition, Pearson
- J. D. Lee, "Concise Inorganic Chemistry", Wiley-Blackwell; 5th edition (February 3, 1999)
- S. F. A. Kettle, "Physical Inorganic Chemistry: A Coordination Chemistry Approach", Oxford University Press 1996.
- The articles in the scientific journals recommended by lecturer and teaching staff.

6. Information on where to find course materials

Course materials can be downloaded from the web-page of the Lecturer

III. Additional information

1. Reference of learning outcomes and learning content to teaching and learning methods and assessment methods

Lecture topic are closely related to laboratory exercises. Lectures provide the background and extensions for the labs.

Symbol of module learning outcome*	Symbol of module learning content##	Methods of teaching and learning	Assessment methods of LO achievement&&
INOCHE_01	TK_02; TK_03; TK_08, TK_10	Lecture, pre-lab quizzes, laboratory work, laboratory	D-written report P- discussion and

		reports	evaluation of the written report P-written exam
INOCHE_02	TK_02; TK_03; TK_05	Lecture, pre-lab quizzes, laboratory work, laboratory reports	D-written report P- discussion and evaluation of the written report F- evaluation of practical skills P-written exam
INOCHE_03	TK_04; TK_05; TK_06	Lecture, pre-lab quizzes, laboratory work, laboratory reports	D-written report P- discussion and evaluation of the written report F- evaluation of practical skills P-written exam
INOCHE_04	TK_03; TK_04; TK_08	Lectures, pre-lab quizzes, laboratory work, laboratory reports	D-written report P- discussion and evaluation of the written report P-written exam
INOCHE_05	TK_05; TK_06; TK_07	Pre-lab quizzes, laboratory work, laboratory reports	D-written report P- discussion and evaluation of the written report F- evaluation of practical skills P-written exam
INOCHE_06	TK_05; TK_07; TK_09	Pre-lab quizzes, laboratory work, laboratory reports	D-written report P- discussion and evaluation of the written report F- discussion, observation, correction of laboratory work P-written exam
INOCHE_07	TK_05; TK_07	Pre-lab quizzes, laboratory work, laboratory reports	F- discussion, during the laboratory P- discussion and evaluation of the written report D- written report
INOCHE_08	TK_01; TK_07; TK_09	Laboratory work	F- discussion, observation, correction of laboratory work
INOCHE_09	TK_01	Laboratory work	F- discussion, observation, correction of laboratory work
INOCHE_10	TK_11	Laboratory work	P- discussion and evaluation of the written report
INOCHE_11	TK_11	Laboratory work	F- discussion, observation, correction of laboratory work P- discussion and evaluation of the

			written report
INOCHE_12	TK_01	Laboratory work	D- written report F- discussion, observation, correction of laboratory work

* e.g. KHT_01 – module code as in Table in II.3 and II.4;

e.g. TK_01 – learning content symbol as in II.4

& Please include both formative (F) and summative (S) assessment

2. Student workload (ECTS credits)

Activity types	Mean number of hours* spent on each activity type
Contact hours with the teacher as specified in the programme	60
Preparation for laboratory #	30
Completion of laboratory reports	5
Preparation for exam	30
Total hours	125
Total ECTS credits for the module	5

* Class hours – 1 hour means 45 minutes

Independent study – examples of activity types: (1) preparation for classes, (2) data analysis, (3) library-based work, (4) writing a class report, etc.

3. Assessment criteria

Final grade will be assigned based on assessment of laboratory exercises and written examination. To pass the course at least 5 (out of 6) laboratory experiments must be completed.

To complete a laboratory exercise a pre-lab quiz must be passed and a satisfactory laboratory report from the experiment work must be handed in due time.

The final exam covers the lecture material and self-study assignments.

Students can be additionally awarded for extra efforts in solving problems, for original thinking in planning the syntheses, extra effort in gaining information from literature survey

Laboratories

Before starting the laboratory student should be familiar with the principles of occupational health and safety in the laboratory. This knowledge will be checked before first laboratory (formative assessment).

Before each laboratory the knowledge and skills concerning the current topic will be checked. To start the experiments a student should obtain at least 2.0 (the scale is from 2.0 to 4.0) points from section A with questions concerning realization of the experiment. Additional 3 points can be obtained from section B (questions concerning general knowledge of the exercise). In case of student failing to obtain at least 50% from section A, section B will not be evaluated. 3 points can be obtained for excellent performance of experiment and for correctness of report with final conclusions. In total student can obtain maximum 10 points for each exercise. To pass the laboratories of inorganic chemistry student should complete at least 5 (of 6) exercises.

According to collected points students will receive:

5.0	55 – 60 points
4.5	50.25 – 54.75 points
4.0	45.5 – 50 points
3.5	40.75 – 45.5 points
3.0	36 – 40.5 points
2.0	<36 points

Outdoor activities

The reports prepared will be assessed based on substantive content of the study. Additional research conclusions (given based on available scientific literature) will be additionally evaluated.

Lecture

The exam will be in written form. Minimum 25 points must be obtained to pass the exam (maximum is 50). The final mark will base on points obtained on a written exam as well as on points collected on laboratories. Students will receive the final mark:

5.0	47-50 points
4.5	43-46 points
4.0	37-42 points
3.5	31-36 points
3.0	25-30 points
2.0	<25points