SYLLABUS

Name: ***Advanced Analytical Methods (27-CHEn-S1R3-AAMW)***
Name in Polish: **Zaawansowane Metody Analizy**
Name in English: ***Advanced Analytical Methods***

Information on course:

Course offered by department: Faculty of Chemistry
Course for department: Faculty of Chemistry
Term: Summer semester 2020/21
Cordinator of course edition: dr hab. Maria Ilczyszyn

Default type of course examination report:

Examination

Language:

English

Short description:

Course objectives
1. Familiarization students with fundamentals of the selected physicochemical methods: molecular and atomic spectroscopy, electrochemistry, mass spectrometry and chromatography and with their application in qualitative and quantitative analysis.
2. Familiarization students with the samples preparation methods for their analysis by above listed physicochemical methods.
3. Development of the students ability to the analysis of the results obtained by various physicochemical methods

Description:

Course content
1. Classification of instrumental analytical methods.
2. Lambert-Beer law and its analytical application.
3. Application of the atomic absorption (AAS) and atomic emission(EAS-ICP) spectroscopy for trace and ultra trace elements analysis.
4. UV-VIS molecular spectroscopy: analytical application of spectrophotometry and fluorescence spectroscopy.
5. FTIR and Raman spectroscopy, their application in biological system analysis.
6. Mass spectrometry – determination and structural analysis of organic compounds.
7. Potentiometry, ion selective electrodes.
8. Voltammetric methods.
9. Conductometry and conductometric titration.
10. Coulometric methods applied to industrial analysis and air pollution observation.
11. Separation and mixtures analysis by gas and liquid chromatography and capillary electophoresis.
12. Students perform qualitative and quantitative analysis of samples obtained from assistant. Used instrumental analytical methods: atomic absorption spectroscopy (AAS), atomic emissionspectroscopy (AES-ICP), flame emission spectroscopy, spectrophotometry, spectrofluorometry, IR spectroscopy, potentiometry, coulometry, voltammetric methods, conductometry, gas and liquid chromatography.

Bibliography:

1. D. A. Skoog, D. M. West, F. J. Holler, S.R. Crouch, Fundamentals of Analytical Chemistry, Thomson Brooks/Cole, 2004.
2. F. Rouessac, A. Rouessac, Chemical Analysis, Modern Instrumentation Methods and Techniques, John Wiley & SonsLtd, 2007.
3. K. Danser, Analytical Chemistry, Theoretical and Metrological Fundamentals, Springer, 2007.
4. R.M. Silverstein, F.X. Webster, D.J. Kiemle, Spectroscopic identification of organic compounds, John Wiley&Sons Ltd, 2005

Learning outcomes:

Knowledge:
• student knows and understands the fundamentals and applications of various physicochemical methods of analysis (K_W01)
• student knows the methods of samples preparation for analysis by help of various physicochemical methods (K_W01)
• student is in possession of basic aspects of equipment construction used in above methods (K_W04)
Skills:
• student is able to select suitable/appropriate methods of analysis taking into account specimen features and type/kind of analysis (K_U01)
• student is able to perform quantitative and qualitative analysis and to analyze the results of these analysis (K_U02)
• student presents the results of analysis in writing (K_U06)

Assessment methods and assessment criteria:

Lecture – written examination
Laboratory – passed test before each experiment (individual) and correctly preparing reports (individual or group).

missing attribute description in English

obligatory courses

Information on course edition:

Default type of course examination report:
Examination
Bibliography:
missing bibliography in English

Details of classes and study groups

Lecture (30 hours)

Study groups details

missing study groups details

Element of course groups in various terms:

Course group description	First term	Last term
missing group description in English (27-CHM-S1R3-PO-La)	2016/17-L	

Course credits in various terms:

<without a specific program>			
Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	3	2014/15	

SYLLABUS

Name: ***Analytical chemistry (27-CHEn-S1R1-AnChW)***
Name in Polish: **Chemia analityczna**
Name in English: ***Analytical chemistry***

Information on course:

Course offered by department: Faculty of Chemistry
Course for department: Faculty of Chemistry
Term: Summer semester 2020/21
Cordinator of course edition: dr hab. Joanna Cybińska

Default type of course examination report:

Examination

Language:

English

Short description:

Course objectives
•To convey knowledge on fundamentals of analytical chemistry
•To strengthen the knowledge on selected aspects of fundamental chemistry, in particular on chemical bonds, structure of chemical compounds, their stability, morphology etc.
•To give the skill in calculations of chemical equilibria
•To give knowledge of basic analytical reactions and techniques in classical analysis, qualitative and quantitative
•To transfer basic information on contemporary instrumental methods in analytical chemistry (spectroscopic, electrochemical, chromatographic, extraction, etc.)

Description:

Course content
Lecture: Role of chemical analysis in studying biological processes. Criterions of choice of chemical reactions for analytical aims (kinetic and thermodynamic). Collection and preparation of samples for analysis, especially the biological materials and drugs. Chemical equilibria in homogeneous systems: acid-base, reductor-oxidizer, metal-ligand, and in heterogeneous systems: solution-precipitate. The factors influencing chemical equilibrium and their analytical consequences. Reactions in non-aqueous solutions. The main analytical techniques including identification, masking, division, and classical methods of quantitative determinations of elements based on the above equilibria (volumetric and gravimetric methods). Examples of advanced determinations of natural samples. Methods: spectrophotometric, electrochemical, chromatographic, extraction – the physical foundations of these methods and their application in examples. Evaluation of the credibility of analytic methods, estimation of errors.
Seminar: Basic definitions. Calculations of concentration. Interionic interactions, Debay-Hückel law. Reactions in one-phase systems. Weak and strong electrolytes. Ostwald equations. Acid-base reactions, calculation of pH of acids and bases (also polyprotic and polyhydroxylic), buffers. Hydrolysis. Amphiprotic electrolytes. Redox equilibria. Nernst potential. Equilibrium of complex formation, stability constans, formation constants. Precipitation, solubility, ionic product. Reactions in multi-phase systems. Titration curves. Indicators. Fundamentals of calculations in instrumental methods of analysis. Application of computer in analysis and data processing.
Laboratory: Selected identification reactions and general rules of identification of cations and anions. Special methods of classical analysis: drop analysis, microcrystalline analysis. Analysis of simple salts, oxides and/or elements. The methods of quantitative transfer of solid sample to solution. Quantitative determinations: alkalimetric, redox, complexometric, gravimetric, precipitation. Physical methods of chemical analysis: atomic emission spectrometry, spectrophotometry UV-Vis, turbidimetry, chromatography (column solid-carrier and thin-layer), coulometry, potentiometry, electrogravimetry, pH-metry. The exercises are performed in 5-hour blocks each preceded by a very short (few minutes) test on the knowledge of the content of instruction for it.

Bibliography:

1.D. A. Skoog, D. M. Wert, F. J. Holler, "Analytical Chemistry", Chicago 1994.
2.G.D. Christian, “Analytical Chemistry”, John Wiley @ Sons Inc. 2004,
3.Instructions for exercises,
4.Zb. Galus (red.), "Ćwiczenia rachunkowe z chemii analitycznej”, PWN Warszawa 1993 (and later editions), in Polish.

Learning outcomes:

Knowledge
Student
• is in possession of general knowledge of chemistry, knows the basic concepts and chemical theories,(K_W01)
• is in the possession of basic aspects of the construction and of scientific equipment (K_W04)
• complies with safety regulations in a chemical laboratory (K_W05)
Skills
Student:
• is able to analyze the problems in the range of chemistry and find solutions to them, based on assimilated theorems and methods (K_U01)
• is able to perform quantitative analysis and formulate qualitative conclusions on their basis (K_U02)

• is able to use numerical methods to solve mathematical problems and experimental data analysis, has the ability to apply basic software packages and some programming languages (K_U04)
• has the linguistic abilities commensurate with the requirements determined for B2 level pursuant to the requirements of Common European Framework of Reference (CEFR) (K_U09)
Social competences:
• student is capable of working in a team, assuming different roles (K_K02)

Assessment methods and assessment criteria:

lecture: written exam, it is possible to correct the note orally.
seminar: permanent evaluation, the final note can be corrected during the final test.
laboratory: students are expected to perform all the exercises planned. After every part (classical qualitative analysis, classical quantitative analysis, instrumental methods) there is opportunity to complete the tasks or to repeat them to obtain better note.

missing attribute description in English

obligatory courses

Information on course edition:

Default type of course examination report:

Examination

Bibliography:

missing bibliography in English

Details of classes and study groups

Lecture (30 hours)

Study groups details

missing study groups details

Element of course groups in various terms:

Course group description	First term	Last term
missing group description in English (27-CHM-S1R1-PO-La)	2014/15-L	

Course credits in various terms:

<without a specific program>

Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	3	2014/15	

SYLLABUS

Name: ***Bachelor laboratory (27-CHEn-S1R3-BL)***
Name in Polish: **Pracownia licencjacka**
Name in English: ***Bachelor laboratory***

Information on course:

Course offered by department: Faculty of Chemistry
Course for department: Faculty of Chemistry
Term: Summer semester 2020/21
Cordinator of course edition:

Default type of course examination report:
Grading
Language:
English

Information on course edition:

Default type of course examination report:
Grading
Bibliography:
missing bibliography in English

Details of classes and study groups

Lab

Study groups details

missing study groups details

Course credits in various terms:

<without a specific program>

Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	5	2020/21-L	

SYLLABUS

Name: ***Chemical analysis of environment and materials (27-CHEn-S1-ChAoEW)***
Name in Polish: **Analiza chemiczna środowiska i materiałów**
Name in English: ***Chemical analysis of environment and materials***

Information on course:

Course offered by department: Faculty of Chemistry
Course for department: Faculty of Chemistry
Term: Winter semester 2017/18
Cordinator of course edition: prof. dr hab. Jacek Gliński

Default type of course examination report:

Examination

Language:

English

Short description:

Course objectives
1. To convey knowledge on fundamentals of physical methods in analytical chemistry
2. To strengthen the knowledge on selected aspects of physics and fundamental chemistry, in particular on chemical bonds, structure of chemical compounds, their stability, morphology etc.
3. To give practical skill on the most important types of physicochemical analytical methods in qualitative and quantitative analysis

Description:

Lecture: Criterions of choice of chemical reactions for analytical aims (kinetic and thermodynamic). Collection and preparation of samples for analysis, especially the biological materials and drugs. Selected instrumental methods in analytical chemistry – physical foundations, construction of typical devices, examples of determinations of natural samples. Evaluation of the credibility of analytic methods, estimation of errors.
Six laboratory sessions, 5h each. Five tasks are performed individually or in pairs, according to schedule. Each exercise will be preceded by short test on the content of instruction. The sixth session is for completing tasks or correcting notes. The exercises are:
• Acid+base and pH+metric titrations of H3PO4 in Pepsi, citric acid in citrons etc.
• Distillation+densitometric determination of ethanol in beer or wine.
• Paper (tissue) chromatography or thin-layer one: different solvents, markers or natural dyes. Separation of plant extract in column solid-carrier chromatograph.
• Colorimetric determination of phosphates
• Turbidimetric determination of sulphates or chlorides in natural water.

Bibliography:

1. Instructions for exercises.
2. Douglas A. Skoog, Donald M. Wert, F. James Holler, Stanley R. Croach, "Fundamentals of Analytical Chemistry, Ninth Edition", Brooks/Cole 2004.
3. Gary D. Christian,”Analytical Chemistry”, John Wiley @ Sons Inc. 2004,

Learning outcomes:

Knowledge
Student:
• possesses general knowledge in chemistry, knows fundamental chemical concepts and theories (K_W01)
• knows basic aspects of construction and operations of scientific equipment (K_W04)
• knows the rules of safety and hygiene of work in chemical laboratory (K_W05)
Skills
Student
• is able to analyze problems in the area of chemistry and finds their solutions based on known theories (K_U01)
• is able to perform chemical analyzes and to formulate on their results the qualitative conclusions (K_U02)
• is able to plan and perform syntheses and physicochemical investigations of chemical compounds and to analyze their results (K_U03)
• is able to gain knowledge independently (K_U07)
Social competences:
• student is able to cooperate in team, undertaking different roles (K_K02)

Assessment methods and assessment criteria:

Lecture: exam (written)
Laboratory: control of the presence and knowledge of the subject matter of classes, implementation (group) of analyzes according to the schedule, writing a report on the classes

missing attribute description in English
elective courses

Information on course edition:

Default type of course examination report:
Examination
Bibliography:
missing bibliography in English

Details of classes and study groups

Lecture (15 hours)

Study groups details

missing study groups details

Element of course groups in various terms:

Course group description	First term	Last term
missing group description in English (27-CHM-S1R1-PW1)	2014/15-L	

Course credits in various terms:

<without a specific program>

Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	3	2014/15	

SYLLABUS

Name: ***Chemical Technology (27-CHEn-S1R3-ChTechW)***
Name in Polish: **Technologia chemiczna**
Name in English: ***Chemical Technology***

Information on course:

Course offered by department: Faculty of Chemistry
Course for department: Faculty of Chemistry
Term: Winter semester 2020/21
Cordinator of course edition: dr hab. Łukasz John

Default type of course examination report:

Examination

Language:

English

Short description:

Course objectives
Assumed results of education upon receiving a credit for a module, a student knows:
- basic terms, technological principles, basic terminology
- design and integration of technological processes
- scale shifting aspects, the economics of production
- basic technological processes (inorganic technology, organic technology, biotechnology, nanotechnology, polymer industry)
- examples of inorganic and organic synthesis technologies, polymers, environmentally friendly technologies
- the row materials used in chemical industry
- the methods of assessment and recycling of materials

Description:

Course content
Lecture and seminar
- Basic concepts, technological pronciples, unit operations and processes, technological schemes, material balances
- Chemical technology relations to fundamental science
- Technological process development, physico-chemical basis of technological processes
- Chemical and technological concepts of the technological processes
- Research scaled in lab
- Process project of installation
- Technological project, basic type of chemical reactors
- Review of more valid chemical technologies
- Polymer manufacturing (chosen synthesis, resources, product properties, applications)
- Chosen biotechnological processes
- Chemical industry resources, utilization of renewable resources
- Economics of technological process
Laboratory
- Consumer products, detergents and cosmetics (synthesis and assessment of technology effectiveness)
- Pharmaceutical chemistry (obtaining of chosen ointments and creams)
- Biodiesel
- Biomaterials (obtaining of biodegradable tissue scaffolds, biopolymers)
- Chemistry and technology of polymers (polyurethanes, polyaniline, polystyrene, poly(acryl amides), polypiroles)
- Industry analytics

Bibliography:

1. R. Smith, Chemical process, design and integration, John Wiley & Sons, Ltd, 2005
2. K. H. Buchel, H. Moreto, P. Wooditsch, Industrial Inorganic Chemistry, John Wiley & Sons, 2000
3. K. Weissermel, H. J. Arpe, Industrial Organic Chemistry, John Wiley & Sons, 2003

Learning outcomes:

Knowledge
Student:
- knows basic definitions, technological principles, unit operations and processes (K_W01)
- knows the rudiments of industrial chemistry (K_W01, K_W02, K_W04)
- knows examples of inorganic and organic synthesis technologies, metals, polymers, material processing, environmentally friendly technologies (K_W01)
- knows the raw materials used in chemical industry (K_W01, K_W02, K_W04)

- knows the methods of assessment and recycling of materials (K_W01, K_W02)
Skills
Student
- is able to prepare a simplified technological project of a chemical process (K_U01, K_U06)
- is able to prepare mass and heat balance for a simple technological process (K_U01)
- complies with safety regulations in a laboratory (K_U01, K_U03)
- is in possession of practical skills within the technology on a laboratory scale (K_U01, K_U03, K_U06, K_U07)
- analyzes the results of laboratory experiments (K_U02, K_U07)
- applies IT techniques for processing and management of experimental data (K_U04)
- elaborates reports on laboratory examinations (K_U08)
- searches for information in specialist literature in both Polish and English individually (K_U07, K_U08)
Social competences
Student
- complies with the safety regulations in a laboratory (K_K01, K_K04)
- is aware of the risks connected with the application of appropriate chemicals technologies (K_K01, K_K04)
- abides by the principles of professional ethics (K_K03, K_K04)
- is able to work in a team (K_K02)

Assessment methods and assessment criteria:

Lecture – written exam
Seminar – quiz and project
Laboratory – quiz and lab report

missing attribute description in English

obligatory courses

Information on course edition:

Default type of course examination report:

Examination

Bibliography:

missing bibliography in English

Details of classes and study groups

Lecture (30 hours)

Study groups details

missing study groups details

Element of course groups in various terms:

Course group description	First term	Last term
missing group description in English (27-CHM-S1R3-PO-Zi)	2016/17-Z	

Course credits in various terms:

<without a specific program>

Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	3	2014/15	

SYLLABUS

Name: ***Civil society, democracy and its institutions (27-CHEn-S1-CiSoDe)***
Name in Polish: **Społeczeństwo obywatelskie, demokracja i jej instytucje**
Name in English:

Information on course:

Course offered by department: Faculty of Chemistry
Course for department: Faculty of Chemistry
Term: Summer semester 2020/21
Cordinator of course edition: dr Łukasz Żukowski

Default type of course examination report:

Grading

Language:

English

Short description:

Completing the course student should:
• Have a general knowledge of functioning democracy and the role and nature of law and human rights and freedoms.
• Indicate the basic divisions, rules and fields of law
• Be able to participate in a short discussion concerning democracy, speech freedom, knowledge based economy and human rights and freedoms in English

Description:

Course content
1. Meaning and nature of law and democracy.
2. The origins and scope of constitution
3.Sources of law in the Constitution.
4. The principles of the system of government
5. The concept of individual rights, freedoms and duties
6. Principle of Social Market Economy in context of Knowledge Based Economy
7. The role of parliament, political parties, courts and tribunals and correct legislation
8. Decentralization, direct democracy, non-governmental organizations and the media in civil society

Bibliography:

1.The Principles of Basic Institutions of the System of Government in Poland, P. Sarnecki, A. Szmyt, Z. Witkowski, Warsaw 1999
2. Law of the European Convention on Human Rights, D. J. Harris, M. O'Boyle, C. Warbrick, E. Bates, Oxford 2009
3. Media law and ethics, R.L. Moore, D.Murray, New York, London 2008

Learning outcomes:

Knowledge
Student has basic knowledge about a human being, in particular as an entity constituting social structures and principles of their functioning and also an entity operating in these structures (K_W07)

Assessment methods and assessment criteria:

- monitoring attendance and progress on the course subject matter,
- presentation (individual or group)/ - exam (written or oral).

Information on course edition:

Default type of course examination report:

Grading

Bibliography:

missing bibliography in English

Details of classes and study groups

Lecture (30 hours)

Study groups details

missing study groups details

Course credits in various terms:

<without a specific program>

Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	5	2020/21-L	

SYLLABUS

Name: ***Communication, information and cognitive processes (27-CHEn-S1-CoInCo)***
Name in Polish: **Procesy komunikacyjne, informacyjne i poznawcze**
Name in English: ***Communication, information and cognitive processes***

Information on course:

Course offered by department: Faculty of Chemistry
Course for department: Faculty of Chemistry
Term: Summer semester 2020/21
Cordinator of course edition: prof. dr hab. Adam Pawłowski

Default type of course examination report:
Grading
Language:
English

Information on course edition:

Default type of course examination report:
Grading
Bibliography:
missing bibliography in English

Details of classes and study groups

Lecture (30 hours)

Study groups details

missing study groups details

Course credits in various terms:

<without a specific program>

Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	5	2020/21-L	

SYLLABUS

Name: ***Elements of Natural Products Chemistry (27-CHEn-S1-EoNPChW)***
Name in Polish: **Elementy chemii produktów naturalnych**
Name in English: ***Elements of Natural Products Chemistry***

Information on course:

Course offered by department: Faculty of Chemistry
Course for department: Faculty of Chemistry
Term: Summer semester 2020/21
Cordinator of course edition:

Default type of course examination report:

Examination

Language:

English

Short description:

Objectives:
• To understand the classification and biosynthesis of natural products.
• To select appropriate methods of natural products investigation depending on their structures and physicochemical properties.

Description:

Content:
Primary and secondary metabolism; definition of natural product; mechanisms of selected metabolic reactions; methods of investigation the biosynthetic pathways of natural products; the examples of natural products formed from: active acetate, shikimic acid, mevalonic acid and amino acids; searching for the new, biologically active compounds, isolation purification and structure elucidation of natural products, basics of metabolomics; biological activity of natural products

Bibliography:

1. Medicinal Natural Products. A Biosynthetic Approach, P. M. Dewick, A John Wiley and Sons, Ltd., 2009.
2. Classics in Spectroscopy . Isolation and Structure Elucidation of Natural Products , S. Berger, D. Sicker, 2009 WILEY-VCH Verlag Weinheim
3. Organic Chemistry, 2nd Edition, J Clayden, N Greeves, S Warren, Oxford University Press 2012
4. The organic Chemistry of Biological Pathways , J McMurry, T. Begley, 2005 Roberts and Company Publishers, Englewood Colorado

Learning outcomes:

Knowledge:
• Student knows and understands the biosynthetic origin and classification of natural products (K_W01)
• Student understands the correlations between chemical structures of natural products and mechanisms of their biological activity (K_W01, K_W09)
Skills:
• Student is able to classify the natural product according to its biosynthetic origin (K_U01)

Assessment methods and assessment criteria:

The written exam

missing attribute description in English

elective courses

Information on course edition:

Default type of course examination report:

Examination

Bibliography:

missing bibliography in English

Details of classes and study groups

Lecture (15 hours)

Study groups details

missing study groups details

Element of course groups in various terms:

Course group description	First term	Last term
missing group description in English (27-CHM-S1R2-PW3)	2015/16-L	

Course credits in various terms:

<without a specific program>			
Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	3	2015/16	

SYLLABUS

Name: ***Elements of Organic Synthesis (27-CHEn-S1-EoOSL)***
Name in Polish: **Elementy syntezy organicznej**
Name in English: ***Elements of Organic Synthesis***

Information on course:

Course offered by department: Faculty of Chemistry
Course for department: Faculty of Chemistry
Term: Summer semester 2020/21
Cordinator of course edition: dr hab. Miłosz Pawlicki

Default type of course examination report:

Grading

Language:

English

Short description:

Objectives:
To bring a practical knowledge necessary in a modern organic laboratory and improve skills important in a multistep synthesis. In addition the quality/purity of the obtained compounds will be verified with a support from spectroscopic methodology broadly applied in modern laboratory.

Description:

Content:
The major task that each student faces during the course is a multistep synthesis requiring a careful handle of each step as any mistake made at the earlier stage makes impossible going further. In the final part of the course it will be necessary to characterise intermediates of the synthetic process faced by each student. It will be realized incorporating the spectroscopic facilities available within the Department (NMR, IR, UV-Vis, Fluorescence). The quality/purity of all intermediates verified with the spectroscopic methodology is necessary as it is a transition in a destination path.

Bibliography:

1.Vollhardt, K.P.C.; Schore, N.E. Organic Chemistry: Structure and Function – any edition
2.McMurry, J. Organic Chemistry (International Edition of 8th Revised Edition) 2011
3.March, J.S. Advanced Organic Chemistry 5th or 6th Edition
4.K. L. Williamson, Masters, K. M. Macroscale and Microscale Organic Experiments 6th Ed. Cengage Learning, Inc. Brooks/Cole, 2011.D.
5.L. Pavia, G. S. Kriz, G. M. Lampman, R. G. Engel A Microscale Approach to Organic Laboratory Techniques, International Edition 5th Ed. Cengage Learning, Inc. 2013
6.Vogel`s Textbook of Practical Organic Chemistry - any edition
7.Zubrick, J. W. The Organic Chemistry Lab Survival Manual: A Student’s Guide to Techniques, John Wiley & Sons, 9th Edition, 2012

Learning outcomes:

Knowledge
Student
• has a fundamental knowledge about organic molecules
• knows and understands a terminology and nomenclature of organic compounds.
• characterizes basic types of organic reactions and understands their mechanisms.
• determines basic properties and reactivity of organic compounds.
• knows and understands the safety procedures necessary in the lab work and applies disposal rules.
Skills
Student:
• is able to analyse basic synthetic approaches
• projects a typical chemical experiment according to the good laboratory practice (GLP)
• synthesises chemical compounds with a usage of proper glassware.
• writes reports from a research and adopts correct tools to do so.
• describes and discuss chemical problems with a vocabulary characteristic for a scientific approach.
• assesses results of an experiment and verifies them with a literature data.
Social Competence
• a self-reliant in extending the chemical knowledge
• a responsibility for the work that has been done especially for an interpretation of results with an extra accent at the scientific reliability.
• a responsibility for a safety in lab-work

Assessment methods and assessment criteria:

Several tests checking the competition of the student for safe work in the lab are planned during the semester. In addition the day-by-day assessment will be conducted by the instructor during the laboratory work.

missing attribute description in English
elective courses

Information on course edition:

Default type of course examination report:
Grading
Bibliography:
missing bibliography in English

Details of classes and study groups

Lab (45 hours)

Study groups details

Group number 1

Class instructors:
dr hab. Miłosz Pawlicki

Element of course groups in various terms:

Course group description	First term	Last term
missing group description in English (27-CHM-S1R2-PW3)	2015/16-L	

Course credits in various terms:

<without a specific program>			
Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	6	2020/21-L	

SYLLABUS

Name: ***Fundamentals of Chemistry (27-CHEn-S1R1-FofChW)***
Name in Polish: **Podstawy chemii**
Name in English: ***Fundamentals of Chemistry***

Information on course:

Course offered by department: Faculty of Chemistry
Course for department: Faculty of Chemistry
Term: Winter semester 2020/21
Cordinator of course edition: dr hab. Jacek Wojaczyński

Default type of course examination report:

Examination

Language:

English

Short description:

Course objectives
Acquiring basic terms and laws of chemistry and the ability of applying them. Assimilating knowledge required to participate in the courses of inorganic, analytical, physical, and organic chemistry. Getting the ability to analyze basic chemical problems and performing calculations based on stoichiometry of chemical processes, calculation and conversion of concentrations, pH of aqueous solutions.
Learning: rules of work in a chemical laboratory, a use of typical glassware, basic laboratory techniques; carrying out and observation of chemical reactions, preparing reports.

Description:

Course content
• Fundamental chemical laws. Elements, chemical compounds, mixtures
• Definitions: mole, molar mass, atomic number, mass number, concentrations
• Chemical reactions – classification, stoichiometry
• Structure of atom, orbitals, electron configuration, Pauli’s principle, Hund’s rule
• Periodic table, periodicity
• Chemical bonds, electronegativity
• Hybridization, symmetry of molecules, VSEPR theory
• Intermolecular interactions, physical states, phase transitions
• Solutions and solubility
• Water, dissociation, acids and bases, pH
• Chemical equilibrium
• Energetics of chemcal reactions, criteria for spotanouos processes
• Rates of chemical reactions
• Fundamentals of electrochemistry
• Nuclear reactions

Bibliography:

L. Jones, P. Atkins – Chemistry, Molecules, Matters, and Change: 3rd edition (1997) and newer editions

Learning outcomes:

Knowledge:
Student:
is in possession of general knowledge of chemistry, knows the basic concepts and chemical theories, (K_W01)
in particular:
• knows and is able to use the basic chemical terminology
• knows and understands the structure of matter – atoms and molecules - and knows related rules
• knows the ways of expressing coomposition of mixtures
• knows the theories of acids and bases and understands pH
• understand the electrolytic dissociation
• understands the basics of electrochemistry, thrmochemistry and chemical kinetics
is in the possession of basic aspects of the construction and of scientific equipment (K_W04)
• knows the basic lab techniques used to perform chemical reactions, separation and purificaction of substances and their analysis
Skills:
Student:
is able to analyze the problems in the range of chemistry and find solutions to them, based on assimilated theorems and methods, (K_U01)
in particular:
• is able to evaluate the results of experiments and relates them to the literature data
• prepares reports on the performed experiments

• knows how to balance chemical reactions
• performs calculations related to basic chemical terms and laws, stoichiometry of chemical reactions, concentrations of solutions and pH

Assessment methods and assessment criteria:

Lecture: written and oral examination, short tests: K_W01
Seminar: written exams, oral answer: K_U01, K_W01
Laboratory: written tests, exercise performing, reports: K_W04, K_U01, K_W01

missing attribute description in English

obligatory courses

Information on course edition:

Default type of course examination report:

Examination

Bibliography:

missing bibliography in English

Details of classes and study groups

Lecture (60 hours)

Study groups details

missing study groups details

Element of course groups in various terms:

Course group description	First term	Last term
missing group description in English (27-CHM-S1R1-PO-Zi)	2014/15-Z	

Course credits in various terms:

<without a specific program>

Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	5	2014/15	

SYLLABUS

Name: ***Fundamentals of Computer Science (27-CHEn-S1R1-FofCW)***
Name in Polish: **Podstawy informatyki**
Name in English: ***Fundamentals of Computer Science***

Information on course:

Course offered by department: Faculty of Chemistry
Course for department: Faculty of Chemistry
Term: Summer semester 2020/21
Cordinator of course edition: prof. dr hab. Robert Wieczorek

Default type of course examination report:

Examination

Language:

English

Short description:

Course objectives
learning how to analyse and present the scientific information

Description:

Course content
1. Searching for scientific information in the internet and chemical databases
2. Drawing molecular structures
3. Preparation of multimedia presentation
4. Introduction to MATLAB
5. Graphics with MATLAB
6. Simple calculations on vectors and matrices
7. Numerical and statistical data analysis
8. Programming in MATLAB

Bibliography:

1. L. V. Fausett, "Applied Numerical Analysis Using MATLAB", Prentice Hall, New Jersey 1999.
2. G. Lindfield, J. Penny, "Numerical Methods Using MATLAB", Prentice Hall, New Jersey 2000.
3. D. Livingstone, "A Practical Guide to Scientific Data Analysis", Wiley, Chichester 2009.
4. P. C. Meier, R. E. Zund, "Statistical Methods in Analytical Chemistry", Wiley, Chichester 2005.

Learning outcomes:

Knowledge
• student has a basic knowledge on appropriate methods and tools for numerical and statistical data analysis and data presentation (K_W02, K_W04)
Skills
• student is able to apply numerical methods for solution of mathematical problems and analysis of the experimental data (K_U02)
• student is able to prepare a simple programs in MATLAB (K_U04)

Assessment methods and assessment criteria:

Lecture: positive evaluation of the written exam.
Laboratory: positive evaluation for the student project.

missing attribute description in English

obligatory courses

Information on course edition:

Default type of course examination report:

Examination

Bibliography:

missing bibliography in English

Details of classes and study groups

Lecture (15 hours)

Study groups details

missing study groups details

Element of course groups in various terms:

Course group description	First term	Last term
missing group description in English (27-CHM-S1R1-PO-La)	2014/15-L	

Course credits in various terms:

<without a specific program>			
Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	5	2014/15	

SYLLABUS

Name: ***Fundamentals of quantum chemistry (27-CHEn-S1R3-FofQW)***
Name in Polish: **Podstawy chemii kwantowej**
Name in English: ***Fundamentals of quantum chemistry***

Information on course:

Course offered by department: Faculty of Chemistry
Course for department: Faculty of Chemistry
Term: Winter semester 2020/21
Cordinator of course edition: dr hab. Jerzy Moc

Default type of course examination report:

Examination

Language:

English

Short description:

Course objectives
Knowledge of foundation of quantum chemistry

Description:

Course content
Elements of classical mechanics: conservative systems, Newtonian mechanics, the Lagrangian and Hamiltonian forms of the equation of motion, internal coordinates and the motion of the center of mass. Quantum chemistry: atomic spectra, blackbody radiation (ultraviolet catastrophe, Planck postulate), photoelectric effect, de Broglie hypothesis, Davisson-Germer experiment, Compton experiment. Postulates of quantum chemistry. Solutions of the Schrödinger equation for: the particle in a box, the potential barrier - tunneling effect and the harmonic oscillator. Angular momentum, particle in a ring, particle in a sphere, rigid rotor. One-electron atom - solution of the Schrödinger equation, radial equation, discussion and properties of orbitals. Electron spin and spin-orbit coupling, atomic terms. Many-electron systems, one-electron approximation, helium atom. The Born-Oppenheimer approximation, the total energy of molecule. The molecular orbital method theory: H2+ molecule, classification of molecular orbitals.

Bibliography:

1. I.N. Levine, "Quantum chemistry", Prentice Hall, Upper Saddle River, 2000.
2. H. Eyring, J. Walter, E. Kimball “Quantum chemistry”, John Wiley & Sons; 1954.
3. K. S. Pitzer, “Quantum chemistry”, Prentice-Hall, 1965.
4. P. Hedvig, „Experimental quantum chemistry”, Akadémiai Kiadó, 1975.

Learning outcomes:

Knowledge
· Student understanding of fundamentals of quantum chemistry and the electronic structure of atomic and molecular systems.(K_W01, KW02)
Skills
· Student ability to present fundamental knowledge related to electronic structure of matter. (K_U06)
Social competences
· Student understands necessity of life-long learning in order to increase his competences. (K_K01)

Assessment methods and assessment criteria:

Lecture: written exam
Seminar: permanent evaluation - written works in the form of simple problems and/or final test

missing attribute description in English

obligatory courses

Information on course edition:

Default type of course examination report:

Examination

Bibliography:

missing bibliography in English

Details of classes and study groups

Lecture (30 hours)

Study groups details

missing study groups details

Element of course groups in various terms:

Course group description	First term	Last term
missing group description in English (27-CHM-S1R3-PO-Zi)	2016/17-Z	

Course credits in various terms:

<without a specific program>

Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	3	2014/15	

SYLLABUS

Name: ***Green Chemistry (27-CHEn-S1-GChW)***
Name in Polish: **Zielona chemia**
Name in English: ***Green chemistry***

Information on course:

Course offered by department: Faculty of Chemistry
Course for department: Faculty of Chemistry
Term: Winter semester 2020/21
Cordinator of course edition: prof. dr hab. Anna Trzeciak
dr Nurbey Gulia

Default type of course examination report:

Examination

Language:

English

Short description:

Course objectives
- Knowledge of the principles of green chemistry and their practical applications in the chemical laboratory and in modern technology;
- An introduction to students with the basic theory of catalysis for use in green chemistry;
- Assimilation of methods of catalytic processes, improvement of catalysts and technology processes leading to reduction of concentration of harmful substances, the introduction of new alternative technologies, catalysis for the production of organic fuels, catalysts for the purification of exhaust gases, the mechanisms of degradation of harmful substances to the environment in the presence of photocatalysts and catalysts for fuel cells;
- An introduction to students with practical laboratory exercises, showing the application of green chemistry and catalysis (e.g. use of the ionic liquids, recycling of the aluminum waste, efficiency tests of the various solar filters).

Description:

Course content
Lecture:
The classification of solvents due to their appropriability in chemical processes. The phenomenon of catalysis, classification of the catalytic processes, activity and selectivity of catalysts, homo-and heterogeneous catalysis - potential applications towards green chemistry. Examples of application of heterogeneous and enzymatic catalysis in environment-friendly processes. Classification of photocatalysts. Catalysis in the production of fuels and organic fuels. Catalysts for purification of exhaust gas. Characteristics and application of the supercritical fluids. Application of microwave and ultrasound energy in chemical processes. Ionic liquids-synthesis, properties and applications in green chemistry. The mechanisms of degradation of the harmful compounds to the environment in the presence of TiO2, photocatalytic processes applied to water purification. Catalysts for fuel cells. Photocatalysts for water oxidation. The use of renewable materials and biotechnological methods in chemical synthesis.
Exercise (labs):
- Application of ionic liquids in the extraction of cobalt(II) compounds.
- Thermochromism of copper(II) anionic complexes.
- Recycling of the aluminum waste.
- Efficiency tests of the various solar filters using UV-Vis spectroscopy.
- Synthesis and analysis of the antimicrobial agent - pyrithione zinc.
- Synthesis of chrome alum (chromium(III)-potassium sulfate).

Bibliography:

1. A.S. Matlack, Introduction to green chemistry, CRC Press, 2010;
2. P.T. Anastas, J.C. Warner, Green Chemistry: Theory and Practice, Oxford University Press, 1998;
3. G.P. Chiusoli, P.M. Maitlis, Metal-catalysis in industrial organic processes, RSC Publishing, 2006;
4. G. Rothenberg, Catalysis. Concept and Green applications, Wiley-VCH, 2008.

Learning outcomes:

Knowledge
Student
• knows the rules of green chemistry (K_W01)
• understands the role of catalysis in modern chemical processes (K_W01)
• classifies the solvents due to their usefulness in specific chemical processes (K_W01, K_W04)
• knows and understands the rules for the application of microwave and ultrasound energy in chemical processes (K_W01)
• has knowledge of the basics of the catalysis in aspect of green chemistry. (K_W01)
Skills

Student
• analyses the processes and chemical reactions for their compatibility with the principles of green chemistry (K_U01)
• selects solvents and reaction conditions, in accordance with the principles of green chemistry (K_U01)
• is able to carry out the simple synthesis of chemical compounds with the principles of green chemistry (K_U03)
Social competence
Student:
• understands the need for a systematic review of the literature to broaden their knowledge in the field of green chemistry and catalysis (K_K01)
• has the ability to organize team work in order to achieve the scheduled tasks; (K_K02)

Assessment methods and assessment criteria:

Lecture: Written exam, possible oral improvement of the notes.
Exercise (labs): a report on the exercise, proper execution of exercises according to the plan, reports containing theoretical part with short review of literature, descriptions of actions and analysis of the obtained results.

missing attribute description in English

elective courses

Information on course edition:

Default type of course examination report:

Examination

Bibliography:

missing bibliography in English

Details of classes and study groups

Lecture (15 hours)

Study groups details

Group number 1

Class instructors:

dr Nurbey Gulia

Element of course groups in various terms:

Course group description	First term	Last term
missing group description in English (27-CHM-S1R2-PW2)	2015/16-Z	

Course credits in various terms:

<without a specific program>

Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	3	2015/16	

SYLLABUS

Name: ***Inorganic Chemistry (27-CHEn-S1R2-InoChW)***
Name in Polish: **Chemia nieorganiczna**
Name in English: ***Inorganic chemistry***

Information on course:

Course offered by department: Faculty of Chemistry
Course for department: Faculty of Chemistry
Term: Winter semester 2020/21
Cordinator of course edition: prof. dr hab. Jerzy Lisowski

Default type of course examination report:

missing description of the type of examination report

Language:

English

Short description:

Course objectives
1. To describe and compare the structural, chemical and physical properties of the main group elements.
2. To understanding types of mechanisms of chemical reactions
3. Determination of reactivity of compounds of the main group elements and complexes with reference to their electronic and molecular structure.
4. To know the nomenclature of inorganic compounds.
5. To know the method of the synthesis of inorganic compounds and metal complexes.
6. To know how find and to prepare standard written papers and oral presentations.
7. To improve the laboratory techniques.

Description:

Content
1.The principles of chemical bonding, structures of ionic solids. The structures of metals; Principles of structure and reactivity of inorganic compounds and metal complexes.
2.Structure of diatomic and polyatomic compounds. Structure and properties of solids.
3.Inorganic reactions. Acids and bases.
4.Properties of the elements and their compounds
5.Classification and nomenclature of inorganic and organometallic compounds.
6.Bonding and electronic structure of complexes based on ligand field theory and molecular orbital theory.
7.Magnetic and spectroscopic properties of transition metal complexes.
8.Reaction mechanism of d-metal complexes
9.Lability and inertness. Kinetics
10.Organometallic compounds. Elements of bioinorganic chemistry.

Bibliography:

1. F. A. Cotton, G. Wilkinson, c. A. Murillo, M. Bochmann, Advanced Inorganic Chemistry, 6-th Ed. Wiley, New York 1999
2. D. F. Shriver, P. W. Atkins, C. H. Langford, Inorganic Chemistry, 4-th Ed. Oxford, 2006
3. J.E. Huheey, E.A. Reiter, R.L. Reiter, Inorganic Chemistry-Principles of Structure and Reactivity, 4-th ed. HarperCollins College Publisher, New York, 1993
4. J. D. Woollins (Ed), Inorganic Experiments, 2-nd ed., Wiley-VCH, Weinheim 2003
5. R. J. Angelici, Synthesis and techniques in inorganic chemistry, Sounders Philadelphia 1977
6. D. F. Shriver and M. A. Drezdon, The manipulation of air-sensitive compounds, Wiley, New York 1986

Learning outcomes:

Knowledge
Student
• knows the principles of bonding, structure and reactivity of inorganic compounds and metal complexes as well as principles of nomenclature
• can evaluate the relationship between structure of inorganic compounds and their physical and chemical properties.
• knows the properties of elements and inorganic compounds
• understands the reaction mechanisms of complex compounds
Skills
• student practically uses laboratory techniques for the synthesis and purification of inorganic compounds, metal complexes with chelated and macrocyclic ligands

Assessment methods and assessment criteria:

Lecture: Written exam
seminar: tests during the semester
laboratory: assessment of preparation for classes and evaluation of the exercise

missing attribute description in English

obligatory courses

Information on course edition:

Default type of course examination report:

missing description of the type of examination report in English

Bibliography:

missing bibliography in English

Details of classes and study groups

Lecture (30 hours)

Study groups details

Group number 1

Class instructors:

prof. dr hab. Jerzy Lisowski

Element of course groups in various terms:

Course group description	First term	Last term
missing group description in English (27-CHM-S1R2-PO)	2015/16	

Course credits in various terms:

<without a specific program>

Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	2	2020/21-Z	

SYLLABUS

Name: ***Inorganic Chemistry (27-CHEn-S1R2-InoChW)***
Name in Polish: **Chemia nieorganiczna**
Name in English: ***Inorganic chemistry***

Information on course:

Course offered by department: Faculty of Chemistry
Course for department: Faculty of Chemistry
Term: Winter semester 2020/21
Cordinator of course edition: prof. dr hab. Jerzy Lisowski

Default type of course examination report:

missing description of the type of examination report

Language:

English

Short description:

Course objectives
1. To describe and compare the structural, chemical and physical properties of the main group elements.
2. To understanding types of mechanisms of chemical reactions
3. Determination of reactivity of compounds of the main group elements and complexes with reference to their electronic and molecular structure.
4. To know the nomenclature of inorganic compounds.
5. To know the method of the synthesis of inorganic compounds and metal complexes.
6. To know how find and to prepare standard written papers and oral presentations.
7. To improve the laboratory techniques.

Description:

Content
1.The principles of chemical bonding, structures of ionic solids. The structures of metals; Principles of structure and reactivity of inorganic compounds and metal complexes.
2.Structure of diatomic and polyatomic compounds. Structure and properties of solids.
3.Inorganic reactions. Acids and bases.
4.Properties of the elements and their compounds
5.Classification and nomenclature of inorganic and organometallic compounds.
6.Bonding and electronic structure of complexes based on ligand field theory and molecular orbital theory.
7.Magnetic and spectroscopic properties of transition metal complexes.
8.Reaction mechanism of d-metal complexes
9.Lability and inertness. Kinetics
10.Organometallic compounds. Elements of bioinorganic chemistry.

Bibliography:

1. F. A. Cotton, G. Wilkinson, c. A. Murillo, M. Bochmann, Advanced Inorganic Chemistry, 6-th Ed. Wiley, New York 1999
2. D. F. Shriver, P. W. Atkins, C. H. Langford, Inorganic Chemistry, 4-th Ed. Oxford, 2006
3. J.E. Huheey, E.A. Reiter, R.L. Reiter, Inorganic Chemistry-Principles of Structure and Reactivity, 4-th ed. HarperCollins College Publisher, New York, 1993
4. J. D. Woollins (Ed), Inorganic Experiments, 2-nd ed., Wiley-VCH, Weinheim 2003
5. R. J. Angelici, Synthesis and techniques in inorganic chemistry, Sounders Philadelphia 1977
6. D. F. Shriver and M. A. Drezdon, The manipulation of air-sensitive compounds, Wiley, New York 1986

Learning outcomes:

Knowledge
Student
• knows the principles of bonding, structure and reactivity of inorganic compounds and metal complexes as well as principles of nomenclature
• can evaluate the relationship between structure of inorganic compounds and their physical and chemical properties.
• knows the properties of elements and inorganic compounds
• understands the reaction mechanisms of complex compounds
Skills
• student practically uses laboratory techniques for the synthesis and purification of inorganic compounds, metal complexes with chelated and macrocyclic ligands

Assessment methods and assessment criteria:

Lecture: Written exam
seminar: tests during the semester
laboratory: assessment of preparation for classes and evaluation of the exercise

missing attribute description in English

obligatory courses

Information on course edition:

Default type of course examination report:

missing description of the type of examination report in English

Bibliography:

missing bibliography in English

Details of classes and study groups

Lecture (30 hours)

Study groups details

Group number 1

Class instructors:

prof. dr hab. Jerzy Lisowski

Element of course groups in various terms:

Course group description	First term	Last term
missing group description in English (27-CHM-S1R2-PO)	2015/16	

Course credits in various terms:

<without a specific program>

Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	2	2020/21-Z	

SYLLABUS

Name: ***Mathematical methods in chemistry (27-CHEn-S1R1-MathW)***
Name in Polish: **Metody matematyczne w chemii**
Name in English: ***Mathematical methods in chemistry***

Information on course:

Course offered by department: Faculty of Chemistry
Course for department: Faculty of Chemistry
Term: Winter semester 2020/21
Cordinator of course edition: dr Przemysław Szklarz

Default type of course examination report:

Examination

Language:

English

Short description:

Objectives:
This is a basic module introducing simple ideas and methods in mathematics to students of chemistry. Topics include linear algebra, data-handling, calculus, differentiation and integration.

Description:

Content:
Symbolic Mathematics and Mathematical Functions
The Solution of Algebraic Equations
Mathematical Functions and Differential Calculus
Integral Calculus
Calculus With Several Independent Variables
Introduction to Linear Algebra

Bibliography:

Robert G. Mortimer, Mathematics for Physical Chemistry, Elsevier 2005

Learning outcomes:

On completion of this module, a student will be able to:
•apply basic mathematical procedures to relevant problems in chemistry; (K_U05)
•identify the essential basis of simple chemical problems and represent these in mathematical form; (K_W03)
•manipulate algebraic expressions, analyse experimental data and carry out essential procedures in calculus. (K_U04)
•solving the complex problems in collaboration with other students (K_K02)

Assessment methods and assessment criteria:

lecture: Written assessment, solving global problems
seminar: Written assessment, solving representative problems

missing attribute description in English

obligatory courses

Information on course edition:

Default type of course examination report:

Examination

Bibliography:

missing bibliography in English

Details of classes and study groups

Lecture (15 hours)

Study groups details

missing study groups details

Element of course groups in various terms:

Course group description	First term	Last term
missing group description in English (27-CHM-S1R1-PO-Zi)	2014/15-Z	

Course credits in various terms:

<without a specific program>			
Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	2	2014/15	

SYLLABUS

Name: ***Molecular driving forces (27-CHEn-S1-MdfW)***
Name in Polish: **Siły i równowaga w układach molekularnych**
Name in English: ***Molecular driving forces***

Information on course:

Course offered by department: Faculty of Chemistry
Course for department: Faculty of Chemistry
Term: Winter semester 2020/21
Cordinator of course edition: dr hab. Andrzej Bil

Default type of course examination report:

Examination

Language:

English

Short description:

Course objectives
To familiarize students with the basic ideas of statistical thermodynamics and its applications in describing important chemical phenomena, such as chemical equilibrium. The course introduces the fundamental role of statistical thermodynamics in understanding heat phenomena, equilibrium in gases and thermal properties of crystals.

Description:

Content
1. Thermodynamics
- First Law of thermodynamics and Energy;
- Second Law of thermodynamics and Entropy;
- Temperature and Heat capacity;
- Thermal and mechanical equilibrium;
- Thermodynamic potentials;
2. Classical Statistical Thermodynamics
- The ensemble method;
- The canonical ensemble;
- The great canonical ensemble;
- Gibbs paradox;
- Classical equipartition principle;
3. Selected applications
- Ideal gases;
- Thermodynamics of crystalline solids; Einstein model;
- Statistical Thermodynamics for ideal gas mixtures;
- Equilibrium constant;
- The notion of potential energy surface and free energy surface;

Bibliography:

1. Dill K., Bromberg S. Molecular Driving Forces.
2. Chandler D. Introduction to modern statistical mechanics.

Learning outcomes:

Knowledge:
• student understands the basic mathematical background of statistical thermodynamics;
• student understands the basic conceptual background of statistical thermodynamics;
Skills
• student is able to solve simple problems illustrating the basic mathematical and conceptual background of statistical thermodynamics;

Assessment methods and assessment criteria:

Lecture: passing mark or above on written exam.
Seminar: passing mark or above on written test.

missing attribute description in English

elective courses

Information on course edition:

Default type of course examination report:

Examination

Bibliography:
missing bibliography in English

Details of classes and study groups

Lecture (30 hours)

Study groups details

missing study groups details

Element of course groups in various terms:

Course group description	First term	Last term
missing group description in English (27-CHM-S1R3-PW4)	2016/17-Z	

Course credits in various terms:

<without a specific program>			
Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	3	2014/15	

SYLLABUS

Name: ***Molecular modeling of biologically relevant systems (27-CHEn-S1-MoMoBio)***
Name in Polish: **Modelowanie molekularne biologicznie istotnych systemów**
Name in English:

Information on course:

Course offered by department: Faculty of Chemistry
Course for department: Faculty of Chemistry
Term: Summer semester 2020/21
Cordinator of course edition: dr hab. Aneta Jezierska
dr hab. Jarosław Panek

Default type of course examination report:
Grading
Language:
English

Information on course edition:

Default type of course examination report:
Grading
Bibliography:
missing bibliography in English

Details of classes and study groups

Lecture (15 hours)

Study groups details

missing study groups details

Seminar (15 hours)

Study groups details

missing study groups details

Course credits in various terms:

<without a specific program>

Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	3	2020/21-L	

SYLLABUS

Name: ***Molecular Physical Chemistry (27-CHEn-S1-MPChW)***
Name in Polish: **Molekularna chemia fizyczna**
Name in English: ***Molecular Physical Chemistry***

Information on course:

Course offered by department: Faculty of Chemistry
Course for department: Faculty of Chemistry
Term: Summer semester 2020/21
Cordinator of course edition: prof. dr hab. Grażyna Bator

Default type of course examination report:

Examination

Language:

English

Short description:

Course objectives
• Revision of problems in theory of intermolecular interactions,
• Elements of statistical and nonequilibrium thermodynamics and their application in physical chemistry
• Introduction to advance problems in chemical kinetics.
• Basic elements of structure and symmetry of condense matter and their dielectric and magnetic properties
• Elementary problems in surface phenomena.
• Practicing in basic physicochemical calculus.

Description:

Course content
1. Molecular interactions
2. Hydrogen bonds and EDA complexes
3. Condense phase structures
4. Condense phase structures symmetry
5. Dielectric properties of matter
6. Dielectric spectroscopy
7. Magnetic properties of matter
8. The basic concepts in chemical kinetics
9. Chemical kinetics of complex reactions
10. Temperature dependence in chemical kinetics
11. Mechanism and chemical reactions
12. The foundation of nonequilibrium thermodynamics
13. Statistical thermodynamics - I
14. Statistical thermodynamics - II
15. Surface phenomena

Bibliography:

1. P.W.Atkins, Physical Chemistry, Oxford University Press, 8th Edition.
2. P.W.Atkins, C.A.Trapp, M.P.Cady, C.Giunta, Student's solutions manual for Physical Chemsitry, Oxford University Press, 6th Edition, 1998.
3. D.Kondepudi, I.Progogine, Modern thermodynamics, Wiley, 1998.
4. C.Kittel, Introduction to Solid State Physics, Wiley, 7th edition, 1996.
5. A.Chełkowski – Dielectric Physics, Elsevier Scientific Pub.Co., 1980.
6. K.Huang, Introduction to statistical physics, Taylor and Francis, 2002.

Learning outcomes:

Knowledge
Student
• ability to name and characterize basic types of intermolecular interactions
• understanding of nonequilibrium and statistical thermodynamics and their application in physical chemistry
• skills for description of time dependence in chemical reactions and their uses in interpretations of complex processes.
• understanding dielectric spectroscopy and its place in classical spectroscopy.
• knowledge about surface phenomena and their place in soft matter.
Skills
Student:
• on the basis of literature student is able to solve elementary physicochemical problem by using thermodynamic methods.
• understand relations between condense matter structures and their symmetry, dielectric, magnetic and optical properties.
• independent use of scientific literature and Web data for find out detail information about physicochemical properties

Social competence
Student
• abilities of self-education planning
• selfdependence in opinion creation about nature science
• conscious of reliability in science and respect copyright law.

Assessment methods and assessment criteria:

oral exam

missing attribute description in English

elective courses

Information on course edition:

Default type of course examination report:

Examination

Bibliography:

missing bibliography in English

Details of classes and study groups

Lecture (30 hours)

Study groups details

missing study groups details

Element of course groups in various terms:

Course group description	First term	Last term
missing group description in English (27-CHM-S1R3-PW5)	2016/17-L	

Course credits in various terms:

<without a specific program>

Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	3	2014/15	

SYLLABUS

Name: ***Organic Chemistry (27-CHEn-S1R2-OrChW)***
Name in Polish: **Chemia organiczna**
Name in English: ***Organic chemistry***

Information on course:

Course offered by department: Faculty of Chemistry
Course for department: Faculty of Chemistry
Term: Winter semester 2020/21
Cordinator of course edition: dr hab. Miłosz Pawlicki

Default type of course examination report:

Examination

Language:

English

Short description:

To present and properly describe fundamental aspects of organic chemistry theoretically (lecture and seminar) and practically (laboratory). In addition the teaching labs focus on bringing a practical knowledge of basic organic reactions leading to formation of target molecules on a way of traditional synthetic approach, and show a correlation between theoretical predictions and a real product. The quality/purity of the obtained compounds verified with spectroscopic methodology.

Description:

Lecture (both semesters autumn and spring, 75h in total):
IUPAC system of the organic compounds naming; structure and properties (chemical and physicochemical) of the organic compounds; synthetic methodology; appearance in Nature; applications in medicine, laboratory and industry.
The structure of organic molecules. Chemical bonds in organic compounds – a dissociation energy. Structure and reactivity. Acids and bases in organic chemistry. Polar and nonpolar organic compounds. Alkanes – construction and reactivity. Free radical halogenations. Cycloalkanes. Stereoisomerism. Properties and reactivity of alkane halogens. Nucleophilic substitution – SN1 and SN2 mechanisms. Elimination reactions. Alcohols – properties and synthetic strategies. Ethers, crown ethers, epoxides and sulphoxides. The nuclear magnetic resonance as a tool for determining organic molecules structure. Alkenes. The oscillation spectroscopy in organic chemistry. Alkynes. Coupled dienes – systems with a delocalized bonds. The electron spectroscopy In the UV-Vis for organic compounds. Benzen and aromaticity – electrophilic substitution (substituents influence on regioselectivity). Carbonyl group – aldehydes and ketones. Enols – reactivity of an enolate ion. Aldol condensation (a,b-unsaturated aldehydes and ketones). Carboxylic acids. Mass spectrometry In organic chemistry. Amines and their derivatives. Benzene derivatives (aromatic amines, phenoles , alkilbenzenes etc.) and their reactivity. Claisen condensation – the synthesis of b-dicarbonyl compounds. Heterocyclic compounds – furan, thiophene, pyrrole, pyridine, porphyrin). Strategy in organic synthesis – basic principles. Aminoacids, peptides, proteins and nucleic acids (biopolymers). Organometallic compounds – synthesis, structure, properties and applications. Polymers – synthetic methodology, structure, properties and applications. Resins – phenol, epoxide and polyester. Biodegradable polymers. Basic aspects of supramolecular chemistry.
Laboratory I (Autumn Semester, 90h, 6h per week) focuses on a traditional qualitative analysis of organic compounds. At the beginning of the semester every student will get a theoretical knowledge and practical skills preparing him/her to independent analysis of unknown organic molecule. A classical classification that introduces : hydrocarbons (saturated and unsaturated), alcohols, carbonyl compounds, carboxylic acids (and derivatives), amines – where a single functional group is present will be established. The examples of organic molecules with two or more functional groups will be discussed and tested (aminoacids, sugars). The characteristic reactions for every functional group will be discussed and performed by every student himself. It allows to get a knowledge necessary for an analysis of unknown molecule that is compulsory for passing the course. The classical analysis is supported by modern, spectroscopic (NMR, IR, Mass, UV-Vis) approach in establishing structures of unknown organic molecules.
Laboratory II (70h; 10 weeks of a spring semester) brings synthetic aspects of organic laboratory work. It starts with a purification of organic compounds (crystallization of a carboxylic acid and a separation of two component mixture). Both experiments introduce fundamental laboratory techniques (recrystallization and steam distillation) that complete the spectrum of available purification techniques introduced within previous courses (simple and fractional distillation, extraction etc.). The main part of the course is focused on the organic synthesis with application of typical reactivity of organic molecules – electrophilic and nucleophilic substitution, aldol like condensations and rearrangements finished with reduction/oxidation processes in organic chemistry. Each student is obligated to synthesize 4-5 compounds where each of them focuses on different type of reactivity. The laboratory creates a perspective necessary to take a part in an allied subject from the offer available during the study (i.e. Elements of Natural Products Chemistry or Elements of Organic Synthesis).

Bibliography:

1.Vollhardt, K.P.C.; Schore, N.E. Organic Chemistry: Structure and Function – any edition
2.McMurry, J. Organic Chemistry (International Edition of 8th Revised Edition) 2011
3.March, J.S. Advanced Organic Chemistry 5th or 6th Edition
4.K. L. Williamson, Masters, K. M. Macroscale and Microscale Organic Experiments 6th Ed. Cengage Learning, Inc. Brooks/Cole, 2011.D.
5.L. Pavia, G. S. Kriz, G. M. Lampman, R. G. Engel A Microscale Approach to Organic Laboratory Techniques, International Edition 5th Ed. Cengage Learning, Inc. 2013

6.Vogel`s Textbook of Practical Organic Chemistry - any edition
7.Zubrick, J. W. The Organic Chemistry Lab Survival Manual: A Student's Guide to Techniques, John Wiley & Sons, 9th Edition, 2012

Learning outcomes:

Knowledge
Student:
• has a fundamental knowledge about organic molecules
• knows and understands a terminology and nomenclature of organic compounds.
• is familiar with fundamentals of the analysis of organic compounds.
• characterizes basic types of organic reactions and understands their mechanisms.
• determines basic properties and reactivity of organic compounds.
• knows and understands the safety procedures necessary in the lab work and applies disposal rules.
Skills
Student
• is able to analyse basic synthetic approaches
• is able to perform a qualitative analysis of organic molecules based on the spectroscopic methodology.
• projects a typical chemical experiment according to the good laboratory practice (GLP)
• synthesises chemical compounds with a usage of proper glassware.
• writes reports from a research and adopts correct tools to do so.
• describes and discuss chemical problems with a vocabulary characteristic for a scientific approach.
• assesses results of an experiment and verifies them with a literature data.
Social Competence
• a self-reliant in extending the chemical knowledge
• a responsibility for the work that has been done especially for an interpretation of results with an extra accent at the scientific reliability.
• a responsibility for a safety in lab-work.

Assessment methods and assessment criteria:

lecture: A writing exam at the end of the second semester (spring) summarizing the presented aspects of organic chemistry.
seminar: A day-by-day evaluation of the progress will be conducted by an instructor during seminars. In addition several writing tests will be conducted at the end of each section of material (i.e. hydrocarbons, alcohols etc.)
laboratory: Several tests checking the competition of the student for safe work in the lab are planned during the semester. In addition the day-by-day assessment will be conducted by the instructor during the laboratory work.

missing attribute description in English

obligatory courses

Information on course edition:

Default type of course examination report:

Examination

Bibliography:

missing bibliography in English

Details of classes and study groups

Lecture (45 hours)

Study groups details

Group number 1

Class instructors:

dr hab. Miłosz Pawlicki

Element of course groups in various terms:

Course group description	First term	Last term
missing group description in English (27-CHM-S1R2-PO)	2015/16	

Course credits in various terms:

<without a specific program>

Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	5	2020/21-Z	