UNIWERSYTET GDAŃSKI

Course title
Wykład specjalizacyjny – Metody analizy fizykochemicznej związków kompleksowych / Graduate study lecture - Methods of physicochemical analysis of complex compounds

ECTS code
13.3.0384

Name of unit administrating study
Faculty of Chemistry

Studies

Field of study	Type	Form	
Chemistry	Master	Full-time studies	

Teaching staff
Prof. dr hab. inż. Lech Chmurzyński

Forms of classes, the realization and number of hours

A. Forms of classes, in accordance with the UG Rector's regulations
Lecture

B. The realization of activities
classes in classrooms

Number of hours
30

ECTS credits

Lecture: 30 hours
consultations: 10 hours
student's own work : 35 hours
Total: 75 hours - 3 ECTS

The academic cycle
2019/2020 summer semester

Type of course
obligatory

Language of instruction
Polish

Teaching methods
Lecture with multimedia presentation

Form and method of assessment and basic criteria for evaluation or examination requirements

A. Final evaluation, in accordance with the UG study regulations
Graded assignment

B. Assessment methods
End-term test

C. The basic criteria for evaluation or exam requirements

Positive grade from the colloquium on the topic presented in the lecture based on program content.

Required courses and introductory requirements

a. **Formal requirements** analytical chemistry, spectroscopic methods, basics of biochemistry
b. **Prerequisites**
- completed courses in analytical chemistry, spectroscopy and biochemistry
- knowledge of the sources of absorption spectra of inorganic compounds, knowledge of the vocabulary used in chemical spectroscopy; competences in interpretation of UV-Vis and IR spectra, knowledge of basic instrumental techniques; Basic knowledge of the structure and properties of amino acids and peptides

Aims of education
acquire all of the issues listed in the contents of the lecture program

Course contents

Basics of potentiometry; the use of potentiometric method to determine the values of acid-base and complex equilibrium constants in solutions; the use of theoretical methods for the estimation of the potentiometric curves; methods to phase transitions studies in biologically active compounds with the use of the differential scanning calorimetry; energy effects of physical and chemical changes; definitions and abbreviations used in the thermal analysis, examples, the scheme and operating principles of the TG, DTA and DSC anlyzer; IR

and UV-vis spectroscopy in chemical analysis, the use of UV-vis spectroscopy for determining of stability and acid-base constants of simple single-core complexes, introduction to chemical kinetics, selected kinetic methods for determining mechanisms of chemical reactions , methods of analysis of the kinetic data based on the spectrophotometric measurements, hydrogen bond, side chain – side chain interaction anisotropic potential of amino acids for ab initio structure predictions of peptides and proteins

Bibliography of literature

A. Literature required to pass the course

A.1. Literature used during classes:

http://www.shu.ac.uk/schools/sci/chem/tutorials/molspec/uvvisab1.htm

http://www.cem.msu.edu/~reusch/VirtualText/Spectrpy/UV-Vis/spectrum.htm

A2. Literature for individual studies:

D. A. Skoog, D.M. West, F.J. Holler – Fudamentals of Analytical Chemistry

J. Kenkel – Analytical Chemistry for Technicians

T. Jasiński – Analiza miareczkowa w środowiskach niewodnych

J. Minczewski, Z. Łada – Miareczkowanie potencjometryczne

J. Minczewski, Z. Marczenko – Chemia analityczna

S.F.A. Kettle – Fizyczna chemia nieorganiczna

S.J. Lippard, J.M. Berg – Podstawy chemii bionieorganicznej

G.W.H. Höhne, W.F. Hemminger, H.J. Flammersheim – Differential Scanning Calorimetry

A. Molski – Wprowadzenie do kinetyki chemicznej

Knowledge

The student

- knows the methodology for determining the structure of chemical compounds and basic spectral methods (infrared spectroscopy, UV-VIS spectroscopy);
- knows the basic classification systems for liquid chemical reaction environments;
- knows and understands the processes of acid-base interactions occurring in non-aqueous environments;
- understands the theory of hydrogen bonding and proton transfer equilibria in non-aqueous environments;
- knows the basic instrumental methods of testing equilibrium in non-aqueous environments;
- knows the theoretical methods enabling the study of the effect of pH and solvent type on the conformation of model peptides and a method for predicting the course of potentiometric titration curves and determining pKa constants for peptide systems;
- knows the correct nomenclature and chemical symbols used in thermal analysis and calorimetry;
- knows the techniques used in thermal analysis and calorimetry;
- knows the elements of chemistry of complex single-core compounds;
- understands the equilibrium of formation of single-core complexes and knows the methodology for determining the stability constants of acid-base single-core complexes by spectrophotometric and potentiometric methods;
- knows selected kinetic methods for determining the mechanisms of chemical reaction: flow methods - stopped flow method, continuous flow method, intermittent flow method;
- knows the methodology for analyzing kinetic data obtained as a result of spectrophotometric measurements;
- knows the hydrogen bond characteristics along with the occurrence (inorganic and organic compounds);
- knows measurement techniques enabling finding hydrogen bond in a chemical compound (infrared spectroscopy, 1H-NMR, UV and UV-VIS spectroscopy, potentiometry, conductometry, calculation methods, calorimetry, dielectric studies, diffraction studies);

- knows the division of amino acids due to the structure of the side chain and understands models for describing hydrophobic association.
Skills The student has the ability to critically evaluate the results of conducted experiments, observations and / or theoretical calculations.
Social competence The student understands the need for lifelong learning, inspires and organizes the learning process of others; is able to use chemical knowledge in correlation with other natural sciences to explain the course of phenomena encountered in everyday life.