UNIVERSITY OF PANNONIA

COURSE DATASHEET

Semester:	2016/17/1
Course:	Chemical analysis
Code:	VEMKKAB114A
Responsible department:	Department of Analytical Chemistry
Department code:	MKKA
Responsible instructor:	Dr. János Kristóf

Course objectives:

To get familiar with the basic methods of analytical chemistry

Course content:

1.Sampling technics, dissolution and digestion, eliminating interfering materials. Chemical equilibria in aqueous solutions (acid-base, precipitation, complex forming, redox). Equilibrium calculations, gravimetry. 2.Volumetric methods of analysis (acid-base, precipitation, complex forming and redox titrations Thermodynamic background of electrode processes. Electrode potential, electromotive force, Nernst equation. 3.Potentiometric methods. Indicator and reference electrodes, measurement of electrode potentials. Direct potentiometric determination of ion concentrations. Potentiometric titrations. 4.Polarography. The potential of the dropping mercury electrode, types of polarographic currents. Advanced polarographic instruments. Qualitative and quantitative analysis. 5.Amperometry. Amperometric titrations with one and two indicator electrodes. Electrogravimetry, controlled-potential electrolysis. Coulombmetric techniques. Conductometry, conductometric titrations. 6.The nature of the electromagnetic radiation (diffraction and superposition of waves, refraction, dispersion). The photoelectric effect. Interaction of electromagnetic radiation with matter. 7.Absorption of electromagnetic radiation. Atomic and molecular absorption. Relaxation processes. Phenomena based on emission of radiation. 8.Atomic spectroscopy. Inductively coupled plasma, flame- and laser excitation. Resolution of emitted radiation, qualitative and quantitative analysis. Atomic absorption spectroscopy. Flame- and electrothermal atomization, background correction methods. 9.Ultraviolet-visible spectroscopy. Mechanism of energy-absorption, qualitative and quantitative analysis. Photometric titrations, fluorescence analysis. 10.Infrared spectroscopy. The harmonic oscillator model. Types of molecular vibrations. Infrared sources and detectors, Fourier-transform instruments. Measurement techniques, evaluation of infrared spectra. Raman spectroscopy. The mechanism of the Raman and the Rayleigh scattering. Construction and operation of Raman spectrometers, evaluation of spectra. 11.Thermal analysis (thermogravimetry, differential thermal analysis, differential scanning calorimetry, simultaneous methods, coupled techniques). 12.Mass spectrometry (ionization methods, mass spectrometric analyzers, quadrupol instruments). Interpretation of mass spectra. 13.Basics of analytical separations. Classification of chromatographic methods, separation models. Gas chromatography. High performance liquid chromatography (HPLC). HPLC equipment. Adsorption and distribution types of separation. Ion chromatography. Size exclusion (gel) chromatography. Thin layer chromatography. 14.Automatic analysis. Flow injection methods (FIA). Stopped-flow techniques, discrete and automatic analyzers. Analytical robots. Construction and operation of automatic elemental analyzers.

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Requirements, evaluation and grading:

Two in-class essays with „passed" rating to attempt oral exam.

Required and recommended readings:

Dr. Kristóf János – Dr. Horváth Erzsébet: Kémiai analízis I. (Klasszikus és kisműszeres analízis). Veszprémi Egyetemi Kiadó, Veszprém, 2002. (Tankönyv). Dr. Kristóf János: Kémiai analízis II. (Nagyműszeres analízis). Veszprémi Egyetemi Kiadó, Veszprém, 2000. (Tankönyv).