UCLouvain

lchm1300

2021

Additional practical work in chemistry

3.00 credits	0 h + 45.0 h	Q2

Teacher(s)	Elias Benjamin ;Filinchuk Yaroslav (coordinator) ;
Language :	French
Place of the course	Louvain-la-Neuve
Prerequisites	Basic chemistry and physics Practical experience in chemistry laboratories
Main themes	The students in small groups will work on a project, which will lead them to state the problem, synthesize the necessary products to solve it, and to characterize them with the appropriate experimental method to solve the problem. This experimental method will be advanced in the sense that it requires technical means usually devoted to research, which are not available in the teaching laboratories. Nuclear Magnetic Resonance, Mass Spectrometry, gas or liquid phase chromatography, X-ray diffraction assisted by molecular modelling are the main methods envisaged in this course. **Description :** After posing the problem, the syntheses of organic and/or inorganic products are performed. Then and in a general way, the students become familiar with the experimental techniques used by analyzing the synthesis samples. This familiarization includes an introduction to the technique, measurement and advanced interpretation of the results. These are recorded in an experiment report. As an example and in a non-limiting way, mass spectrometry will allow to determine the structure and the stability of coordination complexes. NMR will allow to determine the stability constants of several families of complexes, to compare them to each other according to specific factors and to compare them to other experimental techniques. HPLC will allow kinetic monitoring and obtaining the yield of reactions subject to factors such as catalysts, irradiations.Diffraction methods are presented in a context of reaction product analysis, as well as in a way to characterize a completely unknown substance.
Learning outcomes	**At the end of this learning unit, the student is able to :** - The use of modern methods of characterization in chemistry; - The identification of unknown substances by physico-chemical methods. 1 The goal of this course is to teach the students how to analyze advanced problems in chemistry and to familiarize them with advanced instrumental techniques. The students will integrate and critically analyze the obtained experimental results to find a solution to the given chemistry problem.
Evaluation methods	The academic who is responsible for the manipulation will evaluate the students based on written reports. The course coordinator will combine all marks in a unique final note for this course. There are no possibilities to postpone the global evaluation.
Teaching methods	The work is carried out in small groups supervised by academic, scientific and technical staff. The course is of the "learning by projects" type. There is no formal lectures, but information sessions followed by practical and experimental work.
Content	The synthesis of unknown organic and/or inorganic products is carried out. Then, the students will learn instrumental techniques by analyzing the synthesized samples. This familiarization comprises an introduction to the technique, measurements and an advanced interpretation of the results. These results are written up in a formal report. As an example, but not limited to this, mass spectrometry will allow to determine the structure and stability of coordination complexes; NMR will allow to determine the stability constants of several families of complexes; HPLC will allow to follow the kinetics and to determine the yield of reactions involving catalysts, irradiation, etc. Diffraction methods are presented in the context of the analysis of reaction products, as well as aiming to characterize a completely unknown substance. In the crystallographic part of the course, we follow a chemical reaction induced by high energy ball milling. We study different mixtures and products after different milling times using X-ray powder diffraction. Databases and simulations are used for data interpretation. Moreover, in a separate experiment, a crystal structure is determined by single-crystal diffraction.

Inline resources	All the resources needed for this course are available on Moodle. In addition, the following softwares are used: *CrysAlis and Shelx*- single crystal diffraction *Fit2D, ICDD database* - powder diffraction *Mercury*- visualization of crystal structures and simulation of powder diffraction patterns
Bibliography	Les articles scientifiques recommandés sur le sujet de l'étude ainsi que des modes opératoires types sont disponibles sur Moodle. La recherche documentaire est encouragée.
Faculty or entity in charge	CHIM

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Learning outcomes
Minor in Biology	MINBIOL	3		🔍
Minor in Chemistry	MINCHIM	3		🔍
Additionnal module in Chemistry	APPCHIM	3		🔍