UCLouvain

lchm2261b

2023

Polymer Chemistry and Physical Chemistry (part 2 : Polymer Physical Chemistry)

2.00 credits	22.5 h + 7.5 h	Q1

Teacher(s)	Fustin Charles-André ;Gohy Jean-François ;Jonas Alain ;
Language :	English > French-friendly
Place of the course	Louvain-la-Neuve
Prerequisites	This course requires a previous basic knowledge of the physics and chemistry of polymers, as given in the introductory courses LCHM1361 or LMAPR2019, e.g.
Main themes	This course provides an introduction to the characterization of macromolecules in solution. The course is made of flipped classrooms. All topics are not necessarily covered each year. The course discusses the notions of ideal and real chains, the size of macromolecules in solution, the notions of excluded volume and second virial coefficient, the thermodynamic properties of polymer solutions, and different techniques of characterization of polymers in solution (osmometry, viscometry, size exclusion chromatography, static light scattering).
Learning outcomes	**At the end of this learning unit, the student is able to :** 1 The course aims at providing a deep knowledge of chain growth polymerisation methods, as well as of polymer solutions. At the end of the course, the students will be able to analyse results from experimental methods of determination of the molecular characteristics of a polymer (molar mass, distribution of molar mass, radius of gyration), and to predict its behaviour in solution (solubility, swelling, second viral coefficient, interaction parameter, phase separation). They will also be capable to solve small problems of practical relevance in the field of polymer engineering using these and complementary notions. The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".
Evaluation methods	Part of the grade will be given based on the answers to the preparative quizzes of the flipped classrooms. This part will be graded based on effort, not correctness of the answers; a critical use of generative artificial intelligences will be proposed by the teacher for this part. Part of the grade will be given by the continuous evaluation of the student progress at the end of each flipped class. This part will be graded based on the correctness of the answers. The last part of the grade will be based on an oral exam on more theoretical questions on the course; the list of possible questions will be given to the students at the beginning of the course. For this part, let x be the grade on 20 obtained for the quizzes, y the grade on 20 obtained for the tests at the end of the classes, and z the grade on 20 obtained at the exam, then the final grade on 20 is max(z,(x+y)/4+z/2), rounded to the nearest integer except if the grade is between 9 and 10 in which case it is rounded to the closest lower integer. If, for one part of the continous evaluation process, a student does not abide to the methodological instructions defined on moodle by the teachers, including the use of online resources and student collaborations, all the continuous evaluation will obtain a grade of 0.
Teaching methods	The physical chemistry part of LCHM2261 is made of a small number of classes in ***flipped classroom format*** , in which the students resolve small problems and discuss concepts with the teacher, based on a prior reading of a section of the lecture notes and/or on watching podcasts. Before each class, the students have to answer a few questions on their preparative reading (quizzes); their answers are used by the teacher to identify misconceptions and tune the content of the classes. A small interrogation at the end of each class contributes to the continuous evaluation of the students.
Content	1. Thermodynamics of solutions of small molecules - reminders 2. Osmometry 3. Solvent quality and swelling of macromolecular chains in solution 4. Viscometry and size exclusion chromatography 5. Phase diagrams of polymer solutions 6. Solubility parameters 7. Osmometry of macromolecular solutions

	8. Static light scattering by macromolecular solutions At the end of the course, the students will be able to analyze results from experimental methods of determination of the molecular characteristics of a polymer, and to predict its behaviour in dilute solution.
Inline resources	Lecture notes, podcasts and experimental data will be available on the Moodle website of the course.
Bibliography	L'ouvrage de référence suivant couvre *une partie* des concepts de LCHM2261B / the following textbook deals with *part* of the concepts of LCHM2261B: Paul C. Hiemenz & Timothy P. Lodge, Polymer Chemistry, 2nd edition, CRC Press:Boca Raton, 2007.
Faculty or entity in charge	CHIM

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Chemistry	CHIM2M	2		🔍
Master [120] in Physical Engineering	FYAP2M	2		🔍