UCLouvain

lchm1351

2021

Physical chemistry

5.00 credits	45.0 h + 19.0 h	Q1

Teacher(s)	Leyssens Tom ;
Language :	French
Place of the course	Louvain-la-Neuve
Prerequisites	*The prerequisite(s) for this Teaching Unit (Unité d'enseignement – UE) for the programmes/courses that offer this Teaching Unit are specified at the end of this sheet.*
Main themes	Phenomenological aspects of thermodynamics : structure of matter, first and second law of thermodynamics, changes of state : pure materials, phase diagrams, chemical reaction, thermochemical models. Phenomenological aspects of chemical kinetics : rate constant and reaction orders, simple and complex kinetics, reaction and diffusion, surface processes. Microscopic aspects of thermodynamics and kinetic theory : statistical thermodynamics : complexions, distributions, partition function, derivation of thermodynamic functions, kinetic theories : transition state theory, potential surfaces and collision dynamics. Exercises : they aim to concretize and put into practice the thermodynamic and chemical kinetics concepts. The use of microcomputers is an important element to solve the problems of a normal complexity.
Learning outcomes	**At the end of this learning unit, the student is able to :** 1 The objective of the course is to guide students in acquiring basic knowledge in physical chemistry and to apply it to diverse concrete cases. A systematic presentation of the thermodynamic bases (classical and statistical) as well as chemical kinetics, indispensable to the general formation of a chemist or biochemist is provided.
Evaluation methods	The written evaluation takes place during the examination session (January and September). It is a written exam. The weighting is as follows: - Knowledge and reproduction of demonstrations and concepts (+/-20%) - Resolution/interpretation of a more complex situation/problem (+/-80%) This exam will take place on site or remotely depending on health conditions. Sample exams can be found on moodle.
Teaching methods	The basic concepts of each chapter will be explained through a series of podcasts (following a similar protocol to LCHM1211). Students are expected to work through these podcasts on their own according to a schedule established at the beginning of the quadrennium. Question and answer sessions are organized to allow students to ask questions/ discuss the podcasts. Typically, 2 hours are scheduled to work on the podcasts (individually in remote mode) and 2 hours to discuss the podcasts (in person), thus covering 4 hours of class per week.
Content	Physical Chemistry is the part of chemistry that is concerned with understanding why and how chemical (e.g. reactions) or physico-chemical (e.g. phase transition) changes take place. Classically physical chemistry is divided into three branches according to the aspects of understanding aimed at : - Formal thermodynamics : by describing macroscopically the different states before and after the change (e.g. reactants and products), and based on three basic principles, one tries to find out when transformations take place, what this change implies for the system and the environment, ... One is not concerned with what happens during the change, nor with changes at the molecular level. - Kinetics : is interested in what happens during the change from one state to another. The understanding of the path followed, will eventually allow to influence it by external factors. Kinetics is based on experimental observations during changes. - Statistical thermodynamics : is the part of Physical Chemistry that tries to link the macroscopic properties and changes of the system to the variations that take place at the microscopic level. Through statistical treatments, one tries to explain variations in state (thermo-formal) and changes (kinetic) from a molecular point of view, which is often more meaningful to the 'chemist'.
Inline resources	A series of exercises is offered to students.

	These exercises can be done at the student's own initiative and in parallel during the exercise sessions. Exams from previous years and all slides are available on moodle.
Other infos	1. Classical thermodynamics 2. Statistical thermodynamics 3. Kinetics
Faculty or entity in charge	SC

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Learning outcomes
Bachelor in Chemistry	CHIM1BA	5	LCHM1111 AND LCHM1211 AND LCHM1252	