UCL Université catholique de Louvain

LFSAB1302

2016-2017

Chemistry and Physical Chemistry 2

5.0 credits	30.0 h + 30.0 h	1q

Teacher(s) :	Jeanmart Hervé ; Proost Joris ;
Language :	Français
Place of the course	Louvain-la-Neuve
Inline resources:	http://icampus.uclouvain.be/claroline/course/index.php?cid=FSAB1302
Prerequisites :	The prerequisite for this course are the basic notions on chemistry and chemical physics taught in the course LFSAB1301. It requires also a good knowledge of differentials (differentiable functions, exact differentials, partial derivatives, etc.) and integrals. *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 :	The course is built around four topics: the notion of an ideal gas seen from an empirical point of view and through the kinetic gas theory. The first (closed and open systems) and the second principles of thermodynamics that formalise in a rigorous mathematical way concepts such as energy conservation, order and disorder, and free energy. Chemical equilibrium is then introduced to illustrate the power of thermodynamics. Applied to chemical reactions and single component phase transformations, these thermodynamic concepts allow as well to understand and study phenomenon such as of solubility, precipitation, redox equilibrium and electrochemical reactions. Finally, chemical kinetics is exposed to introduce the concepts of reaction rate, order of a reaction, activation energy and to unravel the molecular origin of specific reaction mechanisms.
Aims :	Contribution of the course to the program objectives LO 1.1, 1.2 et 1.3 LO 3.1 LO 4.2 LO 5.6 Specific learning outcomes of the course A the end of the activity, the student should be able to : -- apply, in simple theoretical developments and applications, the law and the properties of ideal gases including the concepts related to the kinetic gas theory ; -- define and apply in exercises related to open or closed systems, the first principle of thermodynamic for systems of constant composition ; -- define mathematically and apply the concept of entropy in relation with heat exchanges. In particular, the student should be able to expose and use the consequences of the existence of entropy on thermodynamic cycles. -- apply the principles of thermodynamics to systems with a variable composition, hence extending the use(fulness) of Gibbs free energy changes to describe chemical equilibrium for various chemical reactions and single component phase changes ; -- understand the concept of chemical potential and activity ; -- derive the constitutive equations describing electrochemical equilibrium (Nernst) from the ones underlying chemical equilibrium ; -- describe and calculate the state of a redox reaction in an electrochemical cell, as well as the impact of different parameters on the electromotive force ; -- explain the concept of reaction rate and order, in relation to an underlying reaction mechanisms for a number of elementary reactions ; -- understand the intimate link between chemical kinetics and chemical equilibrium, based on concepts like transition-state-theory and quasi-stationarity. *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 :	a. Disciplinary learning outcomes The evaluation is based on a written examination. The questions are chosen to assess the learning outcomes defined for the teaching activity. The examination evaluates both the knowledge of the theoretical concepts and the capacity to solve exercises similar to those solved during the teaching activities. An intermediate evaluation is organised to assess students' knowledge on a fraction of the contents of the course. The mark obtained at the intermediate evaluation counts for one third of the final mark if that mark is higher than the mark obtained at the final examination. b. Transversal learning outcomes The LO 3.1, LO 4.2 and LO 5.6 are evaluated through the preparation of a report linked to practical laboratory sessions. The mark from this activity contributes to the final mark.
Teaching methods :	The course is organised in twelve theoretical lessons, ten exercise sessions, and two laboratories.
Content :	-- Ideal gases and kinetic theory of gases -- Complements on the first principle of thermodynamics -- First principle for open systems -- Second principle of thermodynamics -- Chemical equilibrium, chemical potential and activity -- Single component phase transformations -- Redox reactions and electrochemistry -- Chemical kinetics
Bibliography :	Teaching materials: Complete set of documents written by the professors Copy of the slides shown during the theoretical lessons; Documents related to the exercise sessions Instructions for the laboratories Answers to parts of previous examination. All the documents are freely available on the course site (icampus)
Faculty or entity in charge:	BTCI

Programmes / formations proposant cette unité d'enseignement (UE)				
Intitulé du programme	Sigle	Credits	Prerequis	Acquis d'apprentissage
Bachelor in Engineering	FSA1BA	5	LFSAB1301	