

UE Chemical thermodynamics and kinetics - CHI331 -

 ECTS
6 crédits

 Crédits ECTS
Echange
6.0

 Composante
Département
de la licence
sciences et
technologies
(DLST)

 Période de
l'année
Automne (sept.
à dec./janv.)

Diplômes intégrant cet élément

- Licence Chimie

- > Langue(s) d'enseignement: Anglais
- > Ouvert aux étudiants en échange: Oui
- > Crédits ECTS Echange: 6.0

Présentation

Description

The aim of this course is to introduce the kinetics and thermodynamics aspects of chemical and biochemical reactions, as well as physico-chemical state transitions for pure compounds or binary mixtures. The kinetics concepts of reaction rates, rate constants, partial/global order, activation energy and molecular mechanisms will be introduced in lectures, tutorials and practical work. The thermodynamics concepts of enthalpy, entropy, Gibbs energy, equilibrium constants, equilibrium displacement under the influence of different physical (temperature, pressure, volume) or chemical parameters will be introduced during lectures, tutorials and practical work. State changes for pure bodies and binary systems will be studied in addition.

Heures d'enseignement

TD	TD	25,5h
TP	TP	12h
CM	CM	22,5h

Pré-requis recommandés

The General Chemistry module (CHI231), including concepts on the chemical reaction, extent of a reaction, is a pre-requisite to the CHI331 course. The “water and environment” course (CHI202) is a plus for the manipulation of some of the thermodynamics concepts. Students must master the following mathematical basic concepts revisited in MAT102 and MAT208 during the first year: derivatives, primitives, differentials, integration, 1st and 2nd order polynomial equations, the logarithmic and exponential functions, as well as the resolution of simple differential equations and integrations.

Période : Semestre 3

Compétences visées

Chemical kinetics:

- Determine and measure reaction rates
- Study the factors influencing reaction rates (temperature in particular)
- Determine activation energy using the Arrhenius law
- Know the methods for studying and determining global and partial orders
- Study simple-order reactions (0, 1 and 2) using different physico-chemical methods

Thermodynamics

- Evaluate energy exchanges between different interacting systems and reaction quantities
- Carry out a heat balance and use a thermodynamic cycle to calculate a reaction quantity
- Determine entropy in relation to the principle of irreversibility and the second law of thermodynamics
- Assess the equilibrium and non-equilibrium situation of a physico-chemical system using free energy, free enthalpy or the law of mass action
- Predict in which direction and to what extent a system can evolve using the reaction quotient

- Calculate an inversion temperature, measure the impact of modifications imposed on a system in equilibrium and see how it is disturbed (Le Châtelier's and van't Hoff's laws).
- Applications to the study of pure bodies (state diagrams and phase transitions) and binary systems (phase diagrams).

Bibliographie

Chemical thermodynamics, E. Keszzi (Springer)

Physical Chemistry, P. Atkins et al. (Oxford University Press)

Infos pratiques

Contacts

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➤ Grenoble

Campus

➤ Grenoble - Domaine universitaire