



## FSAB1302 Chemistry 2

[30h+30h exercises] 5 credits

This course is taught in the 1st semester

**Teacher(s):** Christian Bailly, Francis Delannay (coord.), Hervé Jeanmart  
**Language:** French  
**Level:** First cycle

### Aims

- To understand the basic concepts of the second principle of thermodynamics, of the Gibbs equilibrium, and the concepts governing the equilibrium in chemical reactions and the foundations of kinetics, with illustrative examples.
- To learn how to model the real world ; to know how to bridge the gap between the concrete reality and abstraction, between individual cases and general laws ; to perceive the validity of model and theories ; to apprehend the importance of the shuttling between observation and prediction.

### Main themes

The course is articulated around 3 themes :

- The second principle of thermodynamics (1.7 ECTS), which allows formalising in a rigorous framework the intuitive notions of order and disorder, of free energy (and its relation with reaction equilibrium), of perfect gases and real gases. The gaseous phase equilibria will be especially considered.
- The chemical equilibrium in aqueous phases (1.7 ECTS), which especially well illustrates the power of thermodynamics. To apply to the reaction mechanisms in aqueous media the thermodynamic concepts allowing to understand and to study the phenomena of acid-base equilibrium, of solubility, of chemical precipitation, of redox equilibrium, and of the electrochemical reactions.
- The chemical kinetics (1,7 ECTS), which aims at the description of the concepts of the rate of reaction, of order of reaction, of activation energy, and at revealing the molecular origin of these concepts.

### Content and teaching methods

Entropy, absolute temperature, variation of entropy associated with chemical reactions, relation between free energy and reaction equilibrium, perfect gases, real gases, equilibrium en gaseous phases, acid-base reactions, neutralisation, buffer solutions, chemical solubility and precipitation, redox equilibrium, and applications for typical electrochemical reactions, cells, electrolysis, corrosion, rate of reaction, order of reaction, activation energy, molecular origin of reaction orders and of chemical equilibrium, Arrhénius relation.

The teaching will consists in magistral courses, a problem based learning session, exercices and laboratory under the supervision of tutors aiming at prompting the students toward reasoning approaches allowing him to understand the topic through personal work. The method will favour the active learning processes.

### Other information (prerequisite, evaluation (assessment methods), course materials recommended readings, ...)

The evaluation has 2 components: an intermediary evaluation during the quadrimester and a final exam at the end of the quadrimester (written exam). The final mark is a combination of the scores in these two evaluations

- Workfiles for each of the parts (available on the website and in printed version); Reference book: University Physics (Freedman and Young)

**Other credits in programs**

<b>FSA11BA</b>	Première année de bachelier en sciences de l'ingénieur, orientation ingénieur civil	(5 credits)	
<b>FSA12BA</b>	Deuxième année de bachelier en sciences de l'ingénieur, orientation ingénieur civil	(5 credits)	Mandatory
<b>FSA13BA</b>	Troisième année de bachelier en sciences de l'ingénieur, orientation ingénieur civil	(5 credits)	