



[45h+54h exercices] 8 credits

This course is taught in the 2nd semester

Teacher(s): Michel Devillers (coord.), Bernard Tinant
Language: french
Level: 1st cycle course

Aims

Quantitative interpretation of chemical phenomena on the basis of physico-chemical laws. Initiation to the use of databases.

Main themes

Thermodynamics : first principle - thermochemistry. Chemical equilibrium : general theory, equilibria in solution : acidobasicity and neutralization curves, precipitation, solubility and pH dependence, complexation and influence on the solubility - Electrochemistry : electrolysis, conductivity ; batteries, redox potentials - Phase equilibria : systems with one and two constituents (liquid-vapor, solid-liquid, liquid-liquid); cryoscopy, ebullioscopy - Thermodynamics : second principle.

Content and teaching methods

Content : Thermodynamics : First principle, forms of energy, state functions, internal energy, enthalpy. Thermochemistry : determination of reaction enthalpies, Hess's law, formation enthalpies (also for ions), combustion enthalpy, solution enthalpy. Bond energy and atomization enthalpy; resonance energy. Chemical equilibrium : reaction prediction and shift of equilibrium (Principles of Berthelot, Mattignon, Le Chatelier); law of mass action; formulations of the equilibrium constant. Ionic equilibria : acid-base equilibria, pH calculations for systems with one or several solutes : buffer mixtures; neutralizations curves; acid-base indicators. Solubility and precipitation. Complexation equilibria and influence of complex formation on solubility. Electrochemistry : electrolytic conductors. Electrolysis : reactions at electrodes and Faraday's law of electrolysis. Electrolytic conductivity and applications of conductimetry. Batteries : Daniell's cell, electromotive force and free energy. Types of electrodes. Electrode potentials and Nernst's equation. Phase equilibria : systems with one or two components (liquid-liquid, liquid-vapor, solid-liquid) Thermodynamics : second principle. Methods : lectures - problem solving in small groups - practical exercises in the laboratory.

Other credits in programs

BIOL12	Deuxième candidature en sciences biologiques	(8 credits)	Mandatory
BIR12	Deuxième année du programme conduisant au grade de candidat bio-ingénieur	(8 credits)	Mandatory
CHIM12	Deuxième candidature en sciences chimiques	(8 credits)	Mandatory