

6.0 credits

30.0 h + 30.0 h

2q

Teacher(s) :	Nysten Bernard ; Legras Roger (coordinator) ; Godard Pierre ;
Language :	Français
Place of the course	Louvain-la-Neuve
Main themes :	<p>Main themes Three general topics will be presented : - the structure of atoms, the periodicity of atomic properties, intra- and inter-molecular bonds and how they control the structure of materials (~2,5 ECTS) ; - an introduction to thermodynamics within the frame of chemical equilibrium, in a rigorous way but without necessarily using the complete formalism of thermodynamics. This includes state variables, the first principle of thermodynamics (energy conservation, internal energy, enthalpy, heat and enthalpy of reaction), the second principle of thermodynamics (spontaneous and non-spontaneous processes, entropy), free energy (including its interest to describe equilibrated reactions and its link to equilibrium constants). The notion of perfect gas will also be introduced rapidly; (~2,5 ECTS) - how these notions are of interest to understand typical physical or chemical equilibria, such as acid/base reactions and one-component phase transformation (melting/crystallization and evaporation/condensation); these examples will be worked on further in practical lab experiments. (~1 ECTS).</p>
Aims :	<i>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".</i>
Content :	<p>Table of contents - Generalities: matter, compounds, molecules, atoms ; measurement units ; energy. - Atoms: Discovery of electrons, protons, neutrons ; periodic table of elements ; light as a wave and emission spectra ; Bohr model, orbitals, quantum numbers, atomic radius ; energy of ionization. - Chemical bonds: types, Lewis structure, electronegativity, bond energy. - Thermochemistry : work, energy, first principle, enthalpy, heat of reaction, of phase change, Hess' law, mass balances. - Second principle of thermodynamics : spontaneous and equilibrated reactions, heat transfer, Boltzmann principle, reaction entropy, Gibbs' free energy, phase changes. - Reaction equilibrium and free energy. Equilibrium constant, acid-base equilibrium, pH (weak and strong acids, salts, buffers, bases). pH computation, titration. Methods will favor active learning techniques. The specific methods are left to the teachers to decide, within the general pedagogical frame set by the EPL. The course will include a few laboratory classes (practicals).</p>
Cycle and year of study :	<p>> Master [120] in Environmental Science and Management > Bachelor in Engineering > Master [60] in Environmental Science and Management</p>
Faculty or entity in charge:	BTCI