


7.00 credits

30.0 h + 40.0 h

Q2

Teacher(s)	Elias Benjamin (coordinator) ;Fustin Charles-André ;
Language :	French
Place of the course	Louvain-la-Neuve
Prerequisites	Concepts and tools equivalent to those taught in teaching units LCHM1111 or LBIR1140
Main themes	<p>The goal of this course is not only to provide the basics of modern organic chemistry, but also to link them to certain fundamental concepts detailed in the general chemistry course (chemical bonding, thermodynamics, chemical kinetics, acid-base reactions).</p> <p>The first part of the course will essentially install the basic concepts by the description of the main classes of functional groups and the organic nomenclature. The physico-chemical properties as well as the electronic effects will be covered then applied to specific examples.</p> <p>The 3D structures of organic molecules, as well as the various isomerisation phenomena that result from it, will be detailed then applied to different examples linked to fundamental biological and biochemical processes.</p> <p>The introduction to chemical reactivity is centred on four main classes of organic functions : alkenes, halogenoalkanes, carbonyl derivatives (aldehydes and ketones) and carboxylic acids and their derivatives. This part leads to the introduction of new concepts, among which the notion of reactive intermediates: nucleophiles and electrophiles, the notion of reaction rate, selectivity in organic chemistry, interconversion between functional groups.</p> <p>In many cases, examples taken from biochemical mechanisms and linked to the field of life sciences will illustrate these concepts. Examples pertaining to daily life will also be used, including polymers and drugs.</p> <p>The theoretical course will be completed by exercise sessions and by a practical course which will familiarize the student with basic techniques such as distillation and chromatography, and teach him some experimental method.</p>
Learning outcomes	<p><b>At the end of this learning unit, the student is able to :</b></p> <p>The main objective of the course is to teach students the basic principles of organic chemistry.</p> <p>The first part of the course will cover the fundamental aspects of structural organic chemistry to familiarize the students with the main families of organic chemistry functions as well as the 3D structure of organic molecules.</p> <p>1 The basics of reactivity will also be covered using four main classes of functions to provide the students with the concepts of reactivity and mechanisms.</p> <p>The course will be frequently illustrated with examples linked to other scientific disciplines, in particular to the field of life sciences.</p>

Evaluation methods	<p><b>Chemistry students (CHIM11BA)</b></p> <p>- In addition to the course, the training includes <b>laboratory sessions (20h) and exercise sessions (20h)</b>.</p> <p>- <b>The practical training</b> is an integral part of the teaching of organic chemistry and constitutes an inseparable part of it. Participation in all <b>practical sessions</b> is therefore <b>MANDATORY</b>.</p> <p>The practical work accounts for <b>1/8 of the overall grade of the CHIM exam</b>. This grade includes the yield and purity of the synthesized products as well as the laboratory tests.</p> <p>Any absence from the practical work must be <b>REASONED</b> (justified by a medical certificate in case of illness or by an official document in case of death of a relative) :</p> <ul style="list-style-type: none"> <li>• In the event of a <b>REASONED</b> absence, the relevant lab session will be cancelled. The final lab grade will only include the sessions performed and will account for 1/8 of the overall exam grade.</li> <li>• Any <b>NON-MOTIVATED</b> absence will result in a mark of <b>0/20 for the overall exam mark, irrespective of the session of exams (2nd or 3rd session)</b>.</li> <li>• <b>There will be no remedial session.</b></li> </ul> <p>These conditions are also valid for <b>BIS students</b> unless they have already obtained a mark of <b>10/20</b> or more for the practical work, in which case they <b>will be exempted</b>.</p> <p>- <b>The final exam</b> accounts for <b>7/8</b> of the overall grade. It will cover all the material taught, <b>including the exercises and laboratory sessions</b>. It will take the form of a written test that may include multiple choice questions.</p> <p>- <b>The average</b> between the practical work grade and the final exam grade is established on Excel and follows the following rule:</p> <p>For any grade greater than or equal to X.50, <b>the overall grade</b> is rounded up to the next unit (i.e. X+1)</p> <p>For any mark strictly inferior to X,50, <b>the global mark</b> is rounded down to the lower unit (i.e. X-1)</p>
Teaching methods	The teaching is done face-to-face. However, some courses and/or introductory sessions and exercises may be given by video due to the number of registrants and the limited capacity of the auditoriums.
Content	<p><b>1. Introduction and reminders :</b> chemistry; carbon; VSEPR theory; representing a molecule; hydrocarbons; major functional groups in organic chemistry.</p> <p><b>2. Isomerism :</b> Constitutional isomers; stereoisomerism; stereogenic center and stereogenic carbon atom; properties of enantiomers; geometric isomerism; conformational isomerism; the cycloalkanes.</p> <p><b>3. Reactivity :</b> Reactions in organic chemistry; nucleophiles and electrophiles; change in electron density on an atom or group of atoms; acidity and basicity in organic chemistry; factors that influence acidity and basicity; effect of solvent.</p> <p><b>4. Multiple bonds :</b> Preamble; stability of alkenes; reactivity of alkenes; Addition of HX to alkene; hydration of an alkene; alcoholysis of an alkene; halogenation of an alkene; hydroboration of an alkene; oxidation of an alkene; alkynes.</p> <p><b>5. Aromatic chemistry :</b> Aromaticity; the electrophilic substitution reactions on aromatic ring; Halogenation, nitration, sulfonation, alkylation, and acylation of aromatic compounds.</p> <p><b>6. Substitution and elimination reactions :</b> Preamble; Alkanes and haloalkanes; The second-order and first-order nucleophilic substitution reaction; Elimination reactions; Substitution and elimination competition.</p> <p><b>7. Alcohols, ethers and epoxides :</b> Preamble; properties of alcohols and ethers; synthesis of alcohols; oxidation of alcohols; oxidation and reduction in organic chemistry; synthesis and reactivity of ethers; synthesis and reactivity of epoxides.</p> <p><b>8. Carboxylic acids and derivatives :</b> preamble; physical properties and reactivity; the activated and deactivated forms of a carboxylic acid; acid chloride; acid anhydride; esters; amides.</p>
Inline resources	Essential course materials are available on the Moodle platform : <ul style="list-style-type: none"> <li>• Slides presented in the cours</li> <li>• Exercise session outlines</li> <li>• Practical work manuals (laboratories) if applicable.</li> </ul>
Bibliography	Chimie organique, P. Bruice – Pearson 2 <sup>e</sup> Edition Chimie organique, simple et intuitive D. Klein – De Boeck Edition
Faculty or entity in charge	CHIM

<b>Programmes containing this learning unit (UE)</b>				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Bachelor in Chemistry	<a href="#">CHIM1BA</a>	7		
Minor in Scientific Culture	<a href="#">MINCULTS</a>	7		