

3.00 credits

22.5 h + 7.5 h

Q1

Teacher(s)	Singleton Michael ;Soumillion Patrice ;
Language :	English > French-friendly
Place of the course	Louvain-la-Neuve
Main themes	<p>1. Concepts of biosynthetic pathways</p> <ul style="list-style-type: none"> <li>- Origin of metabolites</li> <li>- Metabolic pathways</li> <li>- Primary metabolites</li> <li>- Secondary metabolites</li> </ul> <p>2. Isotopic labelling</p> <ul style="list-style-type: none"> <li>- Simple labelling. Radioactive isotopes</li> <li>- Simple labelling. Non-radioactive isotopes</li> <li>- Double labelling</li> <li>- Use of spectroscopic methods (NMR, MS,...)</li> </ul> <p>3. Use of enzymes</p> <ul style="list-style-type: none"> <li>- Use of crude enzymes</li> <li>- Use of purified enzymes</li> <li>- Enzyme stereoselectivity</li> <li>- Enzymatic kinetics</li> <li>- Genetic aspects</li> </ul> <p>4. Application to the main classes of natural products</p> <ul style="list-style-type: none"> <li>- Polyketides</li> <li>- Peptides</li> <li>- Terpenes</li> <li>- Lipids</li> <li>- Steroids</li> <li>- Alkaloids</li> <li>- Sugars</li> <li>- Prostaglandins</li> </ul>
Learning outcomes	<p><b>At the end of this learning unit, the student is able to :</b></p> <p>The knowledge of the chemistry of natural substances is essential to the complete training of any organic chemist.</p> <p>Indeed, there are many fine chemical compounds whose origin can be linked to one or another natural product.</p> <p>In addition, an understanding of the mechanisms of biosynthesis can often serve as a source of inspiration for the chemical synthesis of natural products and derivatives.</p> <p>1 The course will include an introduction to the various biosynthetic pathways, the concept of primary and secondary metabolites and their origin. It will also describe the various methods used to define such metabolic pathways, including isotopic labeling, double labeling, the use of crude enzyme extracts or purified enzymes and the use of spectroscopic techniques.</p> <p>The stereoselectivity of enzymatic reactions will also be demonstrated using relevant examples.</p> <p>Finally, the importance of kinetic studies will be illustrated.</p> <p>This course aims at allowing the student to combine and appreciate the importance of the pooling of various chemical, biological, kinetic, spectroscopic and biosynthetic knowledge to solve multidisciplinary problems.</p>
Evaluation methods	Written report based on the analysis of one or more articles in the literature followed by a discussion of the written work.

Content	<p>Part 1 : Introduction to biosynthetic pathways and definition of metabolites and metabolic pathways. Origin of metabolites and metabolic pathways. Primary and secondary metabolites.</p> <p>Part 2 : Basics of isotopic labelling. Single and double isotopic labelling. Radioactive isotopes. Methods of analysis and hazards. Isotopic dilution. Non radioactive isotopes. Methods of analysis. Importance of NMR techniques, MS, Introduction of isotopes.</p> <p>Part 3 : Use of crude enzyme systems and purified enzymes. Stereoselectivity of enzymatic reactions and their usefulness in determining metabolic pathways. Genetic aspects. Enzymatic kinetics. Plant metabolism.</p> <p>Part 4 : Illustration of the various concepts through families of natural products: polyketides, peptides, terpenes, lipids, steroids, alkaloids, sugars and prostaglandins. Teaching and learning methods: Lecture with diagrams drawn on the board, in order to facilitate note taking by the student. Transparencies for some metabolic pathways. Analysis of recent articles in the literature.</p>
Other infos	<p><b>Prerequisites :</b></p> <ul style="list-style-type: none"> <li>- Basic undergraduate organic chemistry and biochemistry courses.</li> <li>- Organic Chemistry IV (CHM 2140).</li> </ul> <p><b>Materials :</b></p> <ul style="list-style-type: none"> <li>- Lecture notes, overheads, articles from the literature, journals and books from the CHIM library.</li> </ul>
Faculty or entity in charge	CHIM

<b>Programmes containing this learning unit (UE)</b>				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Chemistry	CHIM2M	3		