GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2024-2025

Bio-organic Chemistry (G000855)

Course size *(nominal values; actual values may depend on programme)*

Credits 7.0 **Study time 210 h**

Course offerings in academic year 2026-2027

A (semester 2)	Dutch	Gent

Lecturers in academic year 2026-2027

Sanders, Niek	DIO7	lecturer-in-charge
Meyer, Evelyne	DIO7	co-lecturer

Offered in the following programmes in 2026-2027	**crdts**	**offering**
Bachelor of Science in Veterinary Medicine	7	A

Teaching languages

Dutch

Keywords

Bio-organic chemistry, organic structures, organic reactions, biomolecules (proteins and enzymes, sugars, nucleic acids and lipids), veterinary medicine

Position of the course

In this course the students will be introduced to the structure, nomenclature and properties of bio-organic molecules, gain knowledge and insights into the most important types of organic reactions and their mechanism. During the group exercises the students can train their knowledge and insights. Whens relevant, organic structures will be linked to the properties and reactions of biomolecules.

Contents

In the course we will discuss the structure and properties of functional groups (molecules), their reactivity and nomenclature. More particularly we will discuss the structure and reactivity of: alkanes, cyclo alkanes, alkenes and alkynes, terpenes, alkyl halides, alcohol and thiols, ethers and epoxides, sulphides, amines, aldehydes and ketones, carboxylic acids and derivatives, aromates and hetero aromates and phenols. Stereochemistry and stereochemical reactions also form an important part of the course. The following reactions will be discussed: acidity and basicity, nucleophilic substitutions and eliminations, radical reactions, addition reactions, carbonyl α-substitution reactions, carbonyl condensation reactions, aromatic substitution reactions, oxidation and reduction. An introduction to the biomolecules will also be given.

Initial competences

The incoming student had rather limited knowledge and insights in organic chemistry (about 0 to 2 h/week in the last year secondary school). This implies a gradual construction starting from the basic concepts.

Final competences

1 The students know and understand the structure of atoms, (bio-) organic molecules and can name the hybridization state of C, N, O in (bio-) organic molecules.

2 The students can name simple (bio-) organic compounds and from the name the structure of simple organic molecules draw their structure.

3 The students have insight in the properties and the polarity of covalent bonds

and know and understand the different intermolecular interactions. They can also link this knowledge with the solubility of organic molecules.

4 The students can note the mesomere (resonance) structures of organic molecules.

5 The students have insight in the thermodynamic aspects that determine the balance and the speed of an organic reaction.

6 The students can recognize a carbon radical, a carbocation and carbanion and know their reactivity.

7 The students know and understand the construction and properties of alkanes, cycloalkanes, alkenes, cycloalkenes and dienes. They also know the discussed chemical reactions that these molecules can undergo and can apply these reactions.

8 Students can compare the most important physical properties of the different types of organic compounds (boiling point, melting point, solubility) in an insightful way.

9 The students know and understand the concepts of structure isomers, chiral, achiral, stereoisomers, enantiomers, diastereomers, cis / trans, E / Z, optical isomers, optical activity and understand that the configuration of a drug can determine its activity and toxicity.

10 The students know the structure and chemical reactions that halogen alkanes, alcohols, thiols, ethers, epoxides, sulphides, amines, aldehydes / ketones, carboxylic acids, carboxylic acid derivatives and aromatics can undergo and can also apply these reactions.

11 The students can recognize aromatic molecules.

12 Students understand why some preservatives, weed killers and pesticides are toxic to humans and the environment.

13 The students understand that medicines are organic molecules that exert their therapeutic effect through interactions with biomolecules in the body and that high doses can cause toxicity.

14 The students know the structure of proteins and enzymes, sugars, nucleic acids and fats (starting from the monomers that they must be able to draw).

15 The students can calculate the charge of ionizable functional groups in function of the pH and understand how the acidity of biological matrices (blood, urine, gastric juice, ...) can change the charge of some bio-molecules.

16 Students can derive the basic formula of the enzyme kinetics and understand the concept of enzyme inhibition.

17 The students have insight in the genetic code and in the basic mechanism of replication, transcription and translation.

18 The students understand why some drugs such as penicillins are structural analogues of bio-molecules and act as competitive inhibitors.

19 The students understand how oxygen reversibly binds to hemo- or myoglobin.

20 Students understand how the structure of insulin, collagen and of an immunoglobin explains the function of these molecules.

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Study material

None

References

Course content-related study coaching

Through integrated exercises. Additionally, monitoring service of the veterinary faculty provides study support. The student can always have supplementary explanations on particular issues (after appointing).

Assessment moments

end-of-term assessment

Examination methods in case of periodic assessment during the first examination period

Written assessment with multiple-choice questions, Written assessment with open-ended questions

Examination methods in case of periodic assessment during the second examination period

Written assessment with multiple-choice questions, Written assessment with open-ended questions

Examination methods in case of permanent assessment

Possibilities of retake in case of permanent assessment

not applicable

Extra information on the examination methods

Both open questions, fill-in questions and multiple choice questions will be used. The students may bring their molecular models to the exam. The knowledge and insights into the different aspects of the organic structures and their reactivity will be evaluated. Examples of questions will be shown during the lectures.

Calculation of the examination mark

The written exam includes open questions, fill-in questions and multiple-choice questions. For the assessment of the multiple-choice questions, the higher cesuur (or 'standard setting') method of UGent will be used. The maximum score per question varies from question to question (the maximum score will be mentioned next to each question).
The final score (out of 20) is the score obtained during the periodic evaluation (written exam). The weight of the different parts is as follows: 15 of the 20 points for Organic Chemistry and 5 of the 20 points for Biochemistry. In order to pass this course, the final score must be at least 10 out of 20 and the partial scores for Organic Chemistry and Biochemistry must be respectively at least 6 out of 15 and 2 out of 5. A student cannot pass this course with a score less than these specified partial scores for Organic Chemistry and Biochemistry. If the final score is 10 or more out of 20, but for Organic Chemistry it is less than 6 out of 15, or for Biochemistry less than 2 out of 5, the final score will be reduced to 9 out of 20. Deliberation is possible for students with less than 10 out of 20 if the deliberation rules are met.

The examiner may declare the student who withdraws from the evaluation for this course failed.