

Course MT01002: Organic Chemistry

1. General information

- Term: 2
- Credits: **Total credits 2 (Lecture: 1.5 – Practice: 0.5)**
- **Self-study: 6 credits**
- Credit hours for teaching and learning activities: 30 hrs
- Self-study: 90 hrs.
- Department conducting the course:
 - Department of Chemistry
 - Faculty of Natural Resources and Environment
- Kind of the course:

Foundation <input checked="" type="checkbox"/>		Fundamental <input type="checkbox"/>		Option 1 <input type="checkbox"/>		Option 2 <input type="checkbox"/>	
Compulsory	Elective	Compulsory	Elective	Compulsory	Elective	Compulsory	Elective
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Prerequisite course(s): none

2. Course objectives and expected learning outcomes

* *Course objectives:*

- Knowledge: The course provides for students with knowledge of some general problems of organic chemistry such as the relationship between the structure of organic compounds and their chemical properties (hydrocarbons, derivatives of hydrocarbons). Know the roles, existence, and some physical and chemical properties of some natural compounds (Glucides, amino acids, proteins, lipids).

- Skills: The course provides students with skills in discussion and experimentation, searching skills on the internet to find document; skills of analyzing and summing results.

- Attitude: The course provides students with attitudes in independent learning and teamwork; respect the opinions of individuals, be honest, be careful when handling experimental results.

* *Course expected learning outcomes*

Notation	Course expected learning outcomes (CLOs) After successfully completing this course, students are able to	Program performance criteria (PPC)
Knowledge		
CELO1	Explain knowledge of basic chemical and physical properties of organic compounds and the relationship between the molecular structure of organic compounds and those characteristic properties.	1.1 (P)
Skills		
CELO2	Detecting the problem and able to practice some experiments on the physical and chemical properties of some organic compounds.	6.1 (I)
Attitude		
CELO3	Respect for copyright, be careful and honest in report writing.	9.1 (I)
CELO4	Strictly comply with regulations in chemical use and waste collection after experiments to protect the environment.	9.2 (P)

3. Course description

Brief description of the course: This course consist of the basic theory of organic chemistry consists of the following contents: the isomerism; the interactions between atoms and groups of atoms in molecules of organic compounds; the structure and property of important organic compounds; the reaction mechanism of some popular organic reactions; the structure, the property and the role of some groups of natural compounds such as glucose, lipids, amino acids and proteins. The practical part consists of the quanlitative exercies of the chemical properties of basic organic compounds (3 lab exercies).

4. Teaching and learning & assessment methods

CELOs	CELO1	CELO2	CELO3	CELO4
Teaching methods				
Lecturing	x			
Teaching through practical work	x	x	x	x
Assessment				
Rubric 1. Assignments (10%)				x
Rubric 2. Practical (0%)	x	x	x	x
Rubric 3. Mid-term exam (30%)	x			
Rubric 4. Final exam (60%)	x	x		

5. Student tasks

- Attendance: All students are required to attend at least 75% lecture hours and 100% practical hours.
- Preparation for the lecture: All students must prepare for all lectures.
- Mid-term exam: All students must take the mid-term exam.
- Final exam: All students must take the final exam

6. Text books and references

*** Text Books/Lecture Notes:**

1. Đoàn Thị Thúy Ái, Nguyễn Thị Hiền, Vũ Thị Huyền, Lê Thị Mai Linh, Nguyễn Thị Hồng Hạnh, (2021), Giáo Trình Hóa học Hữu cơ, Nhà xuất bản Học viện Nông nghiệp Việt Nam.
2. Trần Quốc Sơn, Đặng Văn Liễu, Giáo trình cơ sở Hóa Học Hữu cơ Tập 1, tập 2, tập 3 (2017), NXB Đại học Sư Phạm Hà Nội.
3. Đinh Văn Hùng, Trần Văn Chiến. Giáo trình hoá học hữu cơ (2007) NXB Nông nghiệp.

*** Additional references:**

1. Đặng Như Tại, Ngô Thị Thuận. Hóa học hữu cơ tập 1,2,3 (2014). NXB Giáo dục Việt Nam.
2. Ngô Thị Thuận. Hóa học hữu cơ phần bài tập tập 1,2 (2006). NXB Khoa học và kỹ thuật Hà Nội.
4. Nguyễn Thị Hiền *et al*, 2017. Chiết tách và khảo sát độ bền của chất màu croxin từ quả dành dành. Tạp chí Khoa Học Nông Nghiệp tập 14, số 12, tr 1978-1985.
5. Doan Thi Thuy Ai, Vu Thi Huyen, Nguyen Thi Hien, Phung Thi Vinh, Le Thi Mai Linh, 2019. "Preliminary phytochemical analysis and antioxidant activity of leaf extract from *Spondias lakonensis* Pierre". Tạp chí hóa học, 57 (4e 3, 4) 400-404.
6. Đoàn Thị Thúy Ái, Vũ Thị Huyền, Nguyễn Thị Hiền, Ngô Thị Huyền, Nguyễn Thị Hoàng Lan, Nguyễn Thị Thu Trâm, 2019. "Hàm lượng phenolic và hoạt tính kháng oxy hóa của quả lêkima (*pouteria lucuma*) ở các giai đoạn trưởng thành khác nhau". Tạp chí hóa học, 57 (4e 3, 4) 208-212.

7. Course outline

Week	Contents	Expected learning outcomes
1-2	Chapter 1: Introduction	
1-2	A/The main contents in the class (4 hrs): Theory (4 hrs) 1.1. The structure and the property of carbon atom 1.2. Bonding in organic compounds 1.3. Structures of organic compounds 1.3.1. Constitutional isomers 1.3.2. Configurational isomers 1.4. The interaction effect between atoms and groups of atoms in molecules of organic compounds.	CELO1, CELO4
	B/The contents of self-study at home: (12 hrs) 1.5. Mechanism of organic reactions 1.6. Classification of organic compounds and organic reactions Exercises of chap. 1.	
2-4	Chapter 2: Hydrocarbons	
2-3	A/The main contents in the class (7,5 hrs): Theory (5 hrs) 2.1. Saturated hydrocarbons (alkanes, cycloalkanes) 2.1.1. The structure 2.1.2. The chemical properties - The free radical substitution (S _R) - The addition of cycloalkanes - The oxidizing reaction - The Decomposition reaction 2.2. Unsaturated hydrocarbons (alkenes, alkynes, alkadienes) 2.2.1. The structure and naming 2.2.2. The chemical properties - The addition - The substitution of terminal alkynes - The oxidizing reaction - The polymerization 2.3. Aromatic Hydrocarbons (Arenes) 2.3.1. The structure of benzene and aromatic structure 2.3.2. The chemical properties - The electrophilic substitution (S _E) - The addition - The oxidizing reaction Practice: (2,5 hrs) Lab Exercise 1. Preparation and doing reactions of typical properties of saturated, unsaturated, aromatic, and halogenated hydrocarbons	CELO1, CELO2, CELO3,
	B/The contents of self-study at home: (22,5 hrs) - Isomerism of hydrocarbons - Preparing methods - Physical properties - Exercises of Chapter 2	CELO4
4-6	Chapter 3: Derivatives of hydrocarbons	

Week	Contents	Expected learning outcomes
4-6	<p>A/The main contents in the class(9,5 hrs) Theory (7 hrs) 3.1. Derivatives of halogen 3.1.1. The structure 3.1.2. The chemical properties - The nucleophilic substitution (S_N) - The elimination - Reaction of halides with metals (magnesium, zinc, sodium, lithium, potassium) - Properties of the hydrocarbon radical 3.2. Alcohols – Phenols 3.2.1. The structure 3.2.2. The chemical properties - Properties of the polar O-H bond - Properties of the polar C-O bond - Dehydration - The oxidizing reaction - Properties of the hydrocarbon radical 3.3. Carbonyl compounds (aldehydes and ketones) 3.3.1. The structure 3.3.2. The chemical properties - The addition - The oxidizing reaction - Properties of the hydrocarbon radical 3.4. Carboxylic acids 3.4.1. The structure 3.4.2. The chemical properties - The acidity - The properties of the OH group - Decarboxylation - The oxidizing reaction - Properties of the hydrocarbon radical 3.5. Amines 3.5.1. The structure 3.5.2. The chemical properties - Basicity - Reaction of amines with HNO₂ - The electrophilic substitution of aromatic halides 3.6. Mid-term examination (1 hr) Practice: (2,5 hrs) The Lab exercise 2: Doing the reactions of ethanol, phenol, Formaldehyde, Acetone, acetic acid, Glycerol, allylic alcohol and aniline.</p>	CELO1, CELO2, CELO3,
	<p>B/The contents of self-study at home: (28,5 hrs) - Classification and naming of derivatives of hydrocarbons Exercises of Chapter 3</p>	
6-8	Chapter 4. Natural Organic compounds	

Week	Contents	Expected learning outcomes
6-8	<p>A/The main contents in the class (9 hrs) Theory (6 hrs) 4.1. Glucides (carbohydrate) 4.1.1. Classification of carbohydrates 4.1.2. Monosaccharides - The structure - The chemical properties: the nucleophilic addition of carbonyl group (C=O), the oxidizing reaction, the reaction of OH group, the isomerization 4.1.3. Disaccharides - The structure of Maltose, Lactose, Sucrose. - The chemical properties: The oxidizing reaction, hydrolysis. 4.1.4. Polysaccharides - The structure of starch and cellulose - The properties and application of starch and cellulose 4.2. Amino acids 4.2.1. Definition, classification and naming 4.2.2. Preparation 4.2.3. Properties - The hermaphrodite, the bipolar ion and the isoelectric point - The optical properties - The chemical properties Practice: (3 hrs) Lab exercise 3. Doing the typical reactions of monosaccharide, disaccharide, amino acids, lipid, and protein.</p>	CELO1, CELO2, CELO3,
	<p>B/The contents of self-study at home: (27 hrs) - Lipids -Natural macromolecular compounds: proteins, nucleic acids - Other natural compounds: terpenoids, alkaloids, steroids - Exercises of Chapter 4</p>	CELO4