



Universitat de Lleida

# DEGREE CURRICULUM **CHEMISTRY**

Coordination: GIL MESTRES, ADRIA

Academic year 2023-24

## Subject's general information

Subject name	CHEMISTRY				
Code	100300				
Semester	1st Q(SEMESTER) CONTINUED EVALUATION				
Typology	Degree	Course	Character	Modality	
	Double bachelor's degree: Bachelor's Degree in Veterinary Medicine and Bachelor's Degree in Science and Production	1	COMMON/CORE	Attendance-based	
	Double bachelor's degree: Bachelor's Degree in Veterinary Medicine and Bachelor's Degree in Science and Production		COMMON/CORE	Attendance-based	
Course number of credits (ECTS)	6				
Type of activity, credits, and groups	Activity type	PRALAB		PRAULA	TEORIA
	Number of credits	0.7	0.2	2.1	3
	Number of groups	6	8	1	1
Coordination	GIL MESTRES, ADRIA				
Department	ENVIRONMENT AND SOIL SCIENCES AND CHEMISTRY				
Teaching load distribution between lectures and independent student work	60 contact hours 84 hours of student work				
Important information on data processing	Consult <a href="#">this link</a> for more information.				
Language	Catalan (Organic Chemistry) / Spanish (General Chemistry)				
Distribution of credits	2.9 Master lessons 1.4 Problem sessions 1.2 Seminar sessions 0.5 Laboratory sessions				

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
DAVID , CALIN ADRIAN	calinadrian.david@udl.cat	1,2	
GIL MESTRES, ADRIA	adria.gil@udl.cat	3,8	
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SALVADOR TUREGANO, JOSE	jose.salvador@udl.cat	,5	

## Subject's extra information

### PERSONAL PROTECTIVE EQUIPMENT (PPE) for the practical sessions

It is **MANDATORY** that students have the following personal protective equipment (PPE) in the course of teaching practices.

- Laboratory coat UdL unisex
- Safety glasses
- Chemical / Biological protection gloves

The PPE can be purchased at UdL's ÚDELS store

Center for Cultures and Cross-Border Cooperation - Cappont Campus

Carrer de Jaume II, 67 low

25001 Lleida

<http://www.publicacions.udl.cat/>

For more information, check the product listings: <http://www.doblegrauvetcpa.udl.cat/en/pla-formatiu/equipament.html>

For other protection equipment (for example, caps, respiratory masks, etc.), they will depend on the type of practice to be performed. In this case, the responsible professor will inform if the use of these specific PPE is necessary.

Not carrying the PPE described or not complying with the general security regulations detailed below will mean that the student cannot access the laboratories or have to leave the same.

## GENERAL SAFETY RULES IN LABORATORY PRACTICES

- Maintain the place of performance of clean and tidy practices. The work table must be free of backpacks, folders, coats ...
- In the laboratory you can not come with shorts or short skirts.
- Bring closed and covered shoes during the performance of the practices.
- Bring long hair always collected
- Keep the cords fit to protect against spills and spills of chemical substances.
- Do not carry wide bracelets, pendants or sleeves that can be trapped by the equipment, assemblies ...
- Avoid wearing contact lenses, since the effect of chemicals is much greater if they are introduced between the contact lens and the cornea.
- Do not eat or drink in the laboratory
- Smoking is prohibited within laboratories
- Wash your hands whenever you have contact with a chemical and before leaving the laboratory.
- Follow the teacher's instructions and consult any questions about security

## Learning objectives

3.1. Objectives of knowledge: The student that pass the subject must:

- Understand and know how to apply the basic concepts of chemistry, such as the conservation of matter or energy laws
- Relate the macroscopic properties with the microscopic description
- Understand the concept of solution and the ways of expressing its concentration.
- Use of chemical equilibrium to understand the spontaneity of processes (especially chemicals)
- Application of the chemical equilibrium concept, and the equilibrium constant, to predict the final state of acid-base systems (and pH calculation), complexes and redox
- Distinguish different concepts with correction
- Be able to read and interpret correctly the statement of a problem
- Apply the formulas correctly, with the corresponding units, and interpret the results obtained
- Know the basic organic inorganic nomenclature, recognizing the functional groups and the main associated properties
- Relate the chemical knowledge acquired with the knowledge of mathematics, physics and biology that they have received or received
- Familiarize yourself with elemental chemical laboratory material

3.2. Capacity objectives: The student that pass the subject must be able to:

3.2.1 Capacity for professional performance

- Analyse specific situations and understand and define problems
- Apply knowledge acquired, managing the resources available appropriately
- Numerically data analyses
- Select and manage the available written and on-line information sources related to the professional activity
- Use the existing computer tools to support the development of their professional activity

- Work alone and in teams
- Value the integral training, personal motivation, mobility

### 3.2.2. Communication capacity

- Understand and express themselves with the right terminology
- Submit information in written form correctly
- Discuss and argue
- Communicate in different languages (Catalan and Spanish)

### 3.2.3. Technology transfer ability

- Analyse and assess the social and ethical implications of professional activity.
- Have a critical and innovative spirit.
- Recycle in the new technological advances through continuous learning.
- Analyse and evaluate the environmental implications in their professional activity.
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## Competences

The Graduate in Animal and Production Science and Veterinary Medicine must:

### Basic competences:

#### **Veterinary Medicine**

- CB1 Students must have demonstrated possession and understanding of knowledge in an area of study that starts from the basis of general secondary education, and is usually at a level that, although supported by advanced textbooks, also includes some aspects that involve knowledge from the forefront of their field of study.
- CB2 Students are able to apply their knowledge to their work or vocation in a professional manner and possess the competences usually demonstrated through the development and defence of arguments and the resolution of problems within their field of study.
- CB3 That students have the ability to gather and interpret relevant data (usually within their area of study) in order to make judgements that include reflection on relevant social, scientific or ethical issues.
- CB4 Students are able to transmit information, ideas, problems and solutions to both specialist and non-specialist audiences.
- CB5 That students have developed those learning skills necessary to undertake further studies with a high degree of autonomy.

#### **Animal Science and Production**

- CB1 That students have demonstrated possession and understanding of knowledge in an area of study that starts from the basis of general secondary education, and is usually found at a level that, although supported by advanced textbooks, also includes some aspects that involve knowledge from the forefront of their field of study.
- CB2 Students are able to apply their knowledge to their work or vocation in a professional manner and possess the competences usually demonstrated through the development and defence of arguments and the resolution of problems within their field of study.
- CB3 That students have the ability to gather and interpret relevant data (usually within their area of study) in order to make judgements that include reflection on relevant social, scientific or ethical issues.
- CB4 Students are able to transmit information, ideas, problems and solutions to both specialist and non-specialist audiences.
- CB5 That students have developed those learning skills necessary to undertake further studies with a high

degree of autonomy.

- CB6 Recognise the biological, chemical, physical, mathematical and economic foundations necessary for the development of professional activity.

## General competences

### Veterinary Medicine

CG1 Control of hygiene, inspection and technology in the production and preparation of foodstuffs for human consumption from primary production to the consumer.

CG4 Obtaining products of animal origin under optimal and economically profitable conditions and assessing their environmental impact.

GC6 Development of professional practice with respect for other health professionals, acquiring skills related to teamwork, efficient use of resources and quality management.

### Animal Science and Production

- CG2 Use knowledge of basic sciences (biology, physics, biochemistry, physiology, mathematics, statistics, economics,...) to understand animal processes and their implication in the agro-livestock system.

## Specific competences:

### Veterinary Medicine

- CE2. Identify the physical and chemical principles of biological processes and their applications to veterinary sciences.
- CE40 Perform basic analytical techniques and interpret their clinical, biological and chemical results, interpret the results of tests generated by other laboratories as well as collect, preserve and submit all kinds of samples with their corresponding report.

### Animal Science and Production

- CE1 Identify the biological, chemical, physical, mathematical and economic foundations necessary for the development of the professional activity. Identify the characteristics and processes of biomolecules essential for life. Be able to use basic laboratory analytical techniques for the determination of chemical and biochemical parameters.

## Subject contents

### THEORETICAL CONTENTS:

#### **QUÍMICA GENERAL:**

#### **I. INTRODUCTION TO GENERAL CHEMISTRY (8 contact hours)**

1. States of matter. Atomic and molecular mass. Molt concept
2. Stoichiometry and chemical reactions
3. Solutions. Concentration expression
4. The gas laws

#### **II. THERMODYNAMIC (4 contact hours)**

1. Work, heat and the first law
2. Thermodynamic. Enthalpy standard of reaction. Hess law. Heat capacity
3. Sponteneity and second law. Chemical equilibrium concept

#### **III. ACID-BASE EQUILIBRIUM (8 contact hours)**

1. Acid-base concept
2. Acid-base titration. Indicators
3. Monoprotic and polyprotic acid dissociation equilibrium
4. Hydrolysis
5. Buffer solutions. Physiological pH regulation

## IV. PRECIPITATION AND COMPLEXATION EQUILIBRIUM (4 contact hours)

1. Solubility constant
2. Complexation
3. Precipitates solubility

## V. OXIDATION-REDUCTION EQUILIBRIUM (2 contact hours)

1. Oxidation and reduction concept
2. Balancing redox reaction
3. Examples of electrochemical reactions

## **ORGANIC CHEMISTRY:**

## VI. INTRODUCTION TO ORGANIC CHEMISTRY (8 contact hours)

1. Atomic structure
2. Periodic system and periodic properties
3. Chemical bond. Lewis structures and Valence shell electron pair repulsion theory (VSEPR)
4. Bond polarity and intermolecular forces

## VII. ORGANIC MOLECULES (8 contact hours)

1. Formula Types
2. Principal functional groups and their nomenclature
3. Acidity and basicity of organic compounds
4. Structure and properties relationship

## VIII. ISOMERISM AND STEREOCHEMISTRY (6 contact hours)

1. Isomer concept
2. Structural Isomers
3. Organic molecules conformational analysis
4. Stereoisomers. Optical isomers

## IX. INTRODUCTION TO ORGANIC CHEMISTRY REACTIONS (4 contact hours)

1. Terminology and basic concepts of Organic chemistry reactivity
2. Oxidation and reduction reactions
3. Substitution reactions
4. Elimination reactions
5. Addition reactions

**PRACTICE ACTIVITIES:** (All sessions have 2 contact hours)

**Laboratory session 1: Preparing standard solutions and titration I. Acid-base titration.**

Titration of sodium hydroxide solution. Determination of acetic acid in vinegar.

**Laboratory session 2: Preparing standard solutions and titration II. Redox titration.**

Titration of Potassium Permanganate against Oxalic Acid

**Laboratory session 3: Fatty acid extraction from milk.**

Extraction with an organic solvent.

**Laboratory session 4: Productions of animal feed flavours**

Production by Fischer.



## Methodology

### Methodology

- Master classes, alternating face-to-face and non face-to-face sessions
- Problems and questions discussion with small groups.
- Laboratory sessions with the aim of knowing the laboratory safety procedures and the techniques useful for the subject.
- Alternative activities will be carried out for all those activities that cannot be carried out normally due to the current situation

## Development plan

### Learning activities

Activity type	Description	Contact activity student		Activitat no presencial Alumne		Evaluation	Total time	
		Target	Hours	Student work	Hours	Hours	Hours	ECTS
<b>Master class</b>	Master class (Classroom. Large group + Videoconference)	Explanation of the main concepts	<b>30</b>	Study: Gain, understand and synthesize knowledge	<b>41</b>	<b>2</b>	<b>73</b>	<b>2.9</b>
<b>Problems and cases</b>	Participative session (Classroom. Small group + Videoconference)	Resolution of problems and cases	<b>12</b>	Learn to solve problems and cases	<b>21</b>	<b>2</b>	<b>35</b>	<b>1.4</b>
<b>Seminar</b>	Participative session (Small group)	Conducting discussion activities	<b>10</b>	Solve problems and cases. To argue	<b>18</b>	<b>1</b>	<b>29</b>	<b>1.2</b>
<b>Laboratory</b>	Laboratory session (Small group)	Practice development: understanding phenomena, measuring...	<b>8</b>	Write a report	<b>4</b>	<b>1</b>	<b>13</b>	<b>0.5</b>
<b>Total</b>			<b>60</b>		<b>84</b>	<b>6</b>	<b>150</b>	<b>6</b>

## Evaluation

Activity type	Evaluation activity		Percentatge grading
	Procedure	Number	(%)
<b>Master class</b>	Written tests of the theoretical program of the subject	2	<b>50</b>
<b>Practice cases</b>	Case studies deliveries or written tests	2	<b>40</b>
<b>Seminar and Laboratory</b>	Delivery of reports. Written or oral tests	4	<b>10</b>
<b>Total</b>			<b>100</b>

If due to the current situation some activity cannot be developed normally, alternative activities will be carried out in order to evaluate them according to their corresponding qualification weight.

## Bibliography

### Basic bibliography:

- ATKINS, JONES, *Principios de Química. Los caminos del descubrimiento*. 3a Edició, Ed. Médica Panamericana, **2006**
- CHANG, R, *Química*. 9ª Ed. McGraw-Hill, **2007**
- PETRUCCI R.; HARWOOD, W.S. *Química general*, Prentice Hall. Madrid, **1998**.
- WHITTEN, K.W.; DAVIS, R.E.; PECK, M.L. *Química General*. 5a Ed.- McGraw Hill, **1998**.
- PEIDRÓ, J. *Problemas de química para el primer ciclo: un método didáctico, activo, para aprender a resolver problemas*, 3 vol. EUB, Barcelona, **1996**.
- HART H., HART D.J; CRAINE L.E. *Química Orgánica*. McGraw Hill, **1995**.
- VOLLHARDT, K.P.C. *Química Orgánica*. 2a Ed., Omega, **1996**
- SAÑA, J. *Química per a les ciències de la naturalesa i l'alimentació* - Vicens Vives, **1993**.

### Extra bibliography

- ESTEBAN, S.; NAVARRO, R. *Química general* - UNED. 2 vol., **1985**.
- BRILLAS, E. *Fonaments de la termodinàmica electroquímica y cinética* - Barcanova, **1992**.
- CLARET, J.; MAS, F.; SAGUÉS, F. *Termodinàmica Química i Electroquímica* - Llibres de l'Índex. Universitat. Barcelona, **1996**.
- MC MURRAY J. *Química Orgánica*. Addison-Wesley Iberoamericana, **1994**
- BRUICE P.Y. *Organic Chemistry*. Prentice Hall, **1998**.